MODEL AIRPLANE NEWS

MARCH 1944
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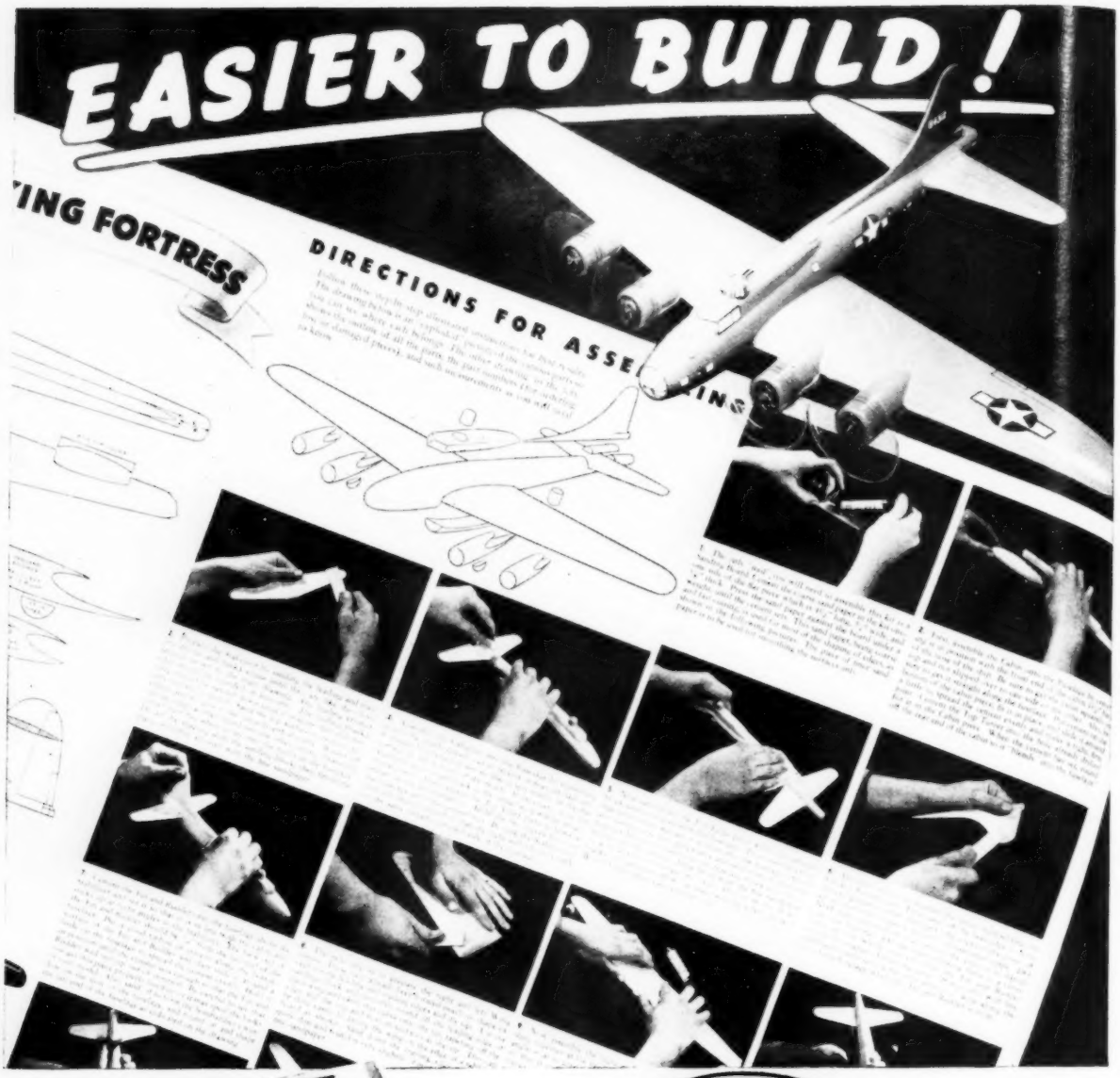

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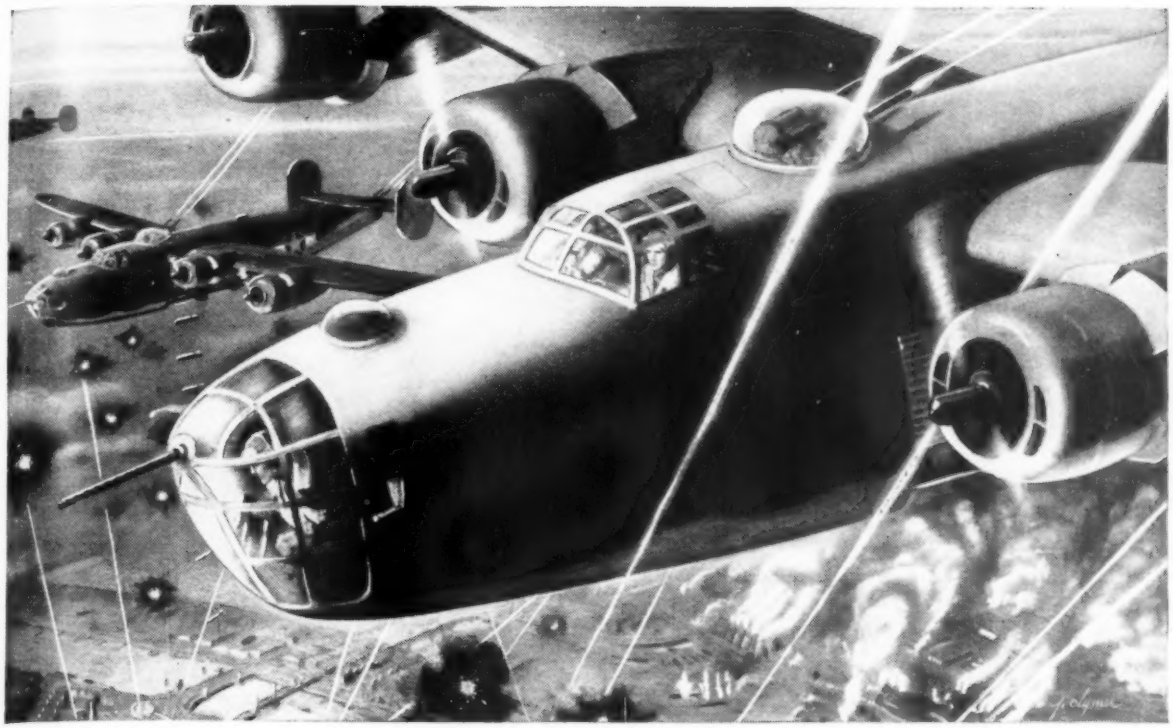

It's You . . . and the Rest of the Team

Your big Liberator is coming in fast now . . . boring head-on through black bursts of flak that rock her like a canoe. From your grandstand seat in the greenhouse, you can see fires down below. That's where the first wave laid its eggs. You're next!

Sometimes, back at "pre-flight", it didn't quite add up. Logarithms . . . formulas . . . classes all day. You couldn't see how you'd ever use the stuff they crammed into your head. But you stuck it out. You wanted Bombardier's wings.

The top-turret guns begin to spit, as you hunch down over your bombsight. Check for altitude! Check for airspeed! The guns are going faster now, but you won't let yourself look up. Check for wind-drift! Suddenly you realize you're doing things automatically . . . all the things that came so hard in training. And you're doing them right!

In advanced school you got pretty cocky. Pilots? Navigators? O. K. for some guys maybe. But you're the man they build bombers around! You pack the knock-out punch!

The Lib heels, and straightens out on her target, and Pete comes in over the interphone: "O. K. Slugger. She's yours. Make it good!" You're the boss now. This is what you've been waiting for. You glue your eye to the sight, and talk into your throat microphone: "Level, Pete . . . hold that level. Bomb-bay doors open. Left a little . . . level now . . . level . . . perfect!" And there's your target—caught in the cross-hairs like a fly in a spider web. You jab the release. *"Bombs Away!"*

Now you've done it! The seconds drag out . . . and then Beezy, back at the tail-gun, yells: "HIT—HIT—HIT—HIT! On target!! Hey, Lieutenant, Come and get your cigar!"

Well . . . ! Your chest starts to swell . . . and then all at once you see that it wasn't just *you* who smeared that Nazi base. It was Pete, up in the pilot's seat . . . Cliff, with his navigation charts . . . the gunners, Jim, Tony, Beezy, Lou. It was you . . . and the *rest* of the crew . . . flying as a team . . .

The same kind of team that paved the way for the landings in the Gilberts . . . that cleaned up the Japs on Kiska . . . that flattened Bremen and Wilhelmshaven . . . that is carrying the war to Japan . . .

The A.A.F. . . . the greatest team in the world!

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MEN OF 17 . . .

You can get ready now for your place—as Bombardier, Navigator or Pilot—on this great A.A.F. team. Go to the nearest Aviation Cadet Examining Board . . . see if you can qualify for the Air Corps Enlisted Reserve. If you qualify, you will receive Enlisted Reserve insignia . . . but will not be called for training until you are 18 or over.

When called, you'll be given 5 months' training (after a brief conditioning period) in one of America's finest colleges . . . you'll get dual-control flying instruction . . . then go on to eight months of full flight training . . . the kind of training that makes America's fliers the world's best! When you graduate as a Bombardier, Navigator or Pilot—you will receive a $250 uniform allowance and your pay will be $246 to $327 per month.

Meanwhile, see your local Civil Air Patrol Officers about C.A.P. Cadet training . . . also your High School principal or adviser about recommended courses in the Air Service Division of the H. S. Victory Corps. Both afford valuable pre-aviation training.

(Essential workers in War Industry or Agriculture—do not apply.)

For information regarding Naval Aviation Cadet Training, apply at the Naval Aviation Cadet Selection Board in any office of Naval Officer Procurement, or at any Navy Recruiting Station; or, if you are in the Navy, Marine Corps or Coast Guard, apply through your commanding officer . . . This advertisement has the approval of the Joint Army Navy Personnel Board.

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ARMY AIR FORCES

15TH YEAR OF PUBLICATION

MODEL AIRPLANE NEWS

MARCH, 1944 VOL. XXX, No. 3

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FLASH

NAVY SPOKESMAN Captain J. W. C. Brand announces the debut of the Curtiss *Helldiver* SB2C-1 (MODEL AIRPLANE NEWS, July, 1941 issue) as a team-mate for the Grumman *Avenger* TBF-1 and Douglas *Dauntless* SBD. Captain Brand proudly asserts that the *Helldiver* will take no prop wash from any of its type, friend or foe. . . . While slashing costs in half, Boeing has upped production to a brilliant 146% of 1942. . . . Douglas set a world record in 1943 with the delivery of ONE BILLILON dollars worth of airplanes to the armed forces and is now hacking away at a backlog of THREE billion dollars. . . . A huge marble monument will rise in honor of the Wright Brothers at Maxwell Field, the site of the first civilian training school. . . . Success of the armored vests and aprons worn by the 8th Air Force bomber pilots in England has resulted in the experimental tests of armored helmets, similar to those worn by King Henry VIII's men. Bulbous face-piece has not been modified as it fits oxygen mask face-pieces to a tee. . . . Removal of camouflage on practically ALL Army Air Forces planes is announced. Combat experience has proven that the unpainted, shiny metal is just as difficult for the enemy to see and moreover when the sun shines its reflection blinds the enemy to attackers. Announced saving in paint weight: 80 lbs. on bombers, 20 lbs. on fighters.

DURING 1943 a total of 6% of all U.S. imports came in by air. A unit of air-cargo was 80 times as valuable, 20 times as safe and 6 times as fast as surface cargo. . . . Switzerland is drawing up plans for 18-hour nonstop transport from there to here. . . . Kaiser claims brobdingnagian Kaiser-Hughes flying boat will be ready for model tests before March. . . . First test flight of Waco CG-13, biggest glider yet, was pronounced okay by test pilot Lt. Col. Bruce Price. Built by Northwest Aeronautical Corporation, the giant craft (see cut) has load capacity greater than famed Douglas C-47. . . . The Dodge Division of the

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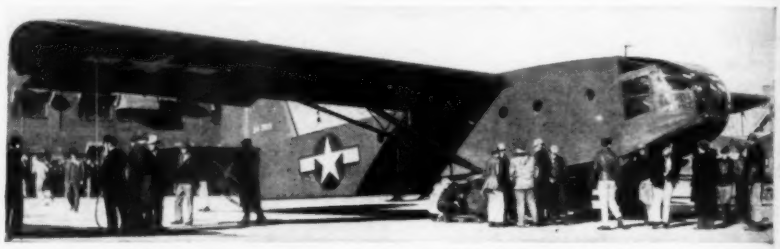

Largest glider ever built, new Waco CG-13 built by Commonwealth, carries 6-8 tons

JET PROPULSION PLANE PERFECTED

United Nations announce production of new fighter

IN A joint statement, the British Royal Air Force and the United States Army Air Forces have announced the first successful jet-propelled airplane. Long awaited, the new craft is propeller-less and its thrust is developed by a jet of hot air forced through a small nozzle thus imparting extremely high velocity to the stream and making possible far greater propulsive energy than is now available in the conventional engine-propeller combination. As with many other aerodynamic and thermodynamic advances, the new application of the principle was "invented" by several independent workers who were encouraged into a cooperative venture by many military research agencies. Group Captain Frank Whittle, R.A.F. (now Wing Commander), well-known British acrobatic flier, first patented the device in 1930 and began research on the power plant in 1933. He was placed on detached duty and won high honors in mechanical science at Cambridge between 1933 and 1936 which he attended to further his knowledge and experience on the project. It was not until four years later in April, 1937, that his first engine ran successfully.

In 1938 a group of Royal Air Force officers, Wing Cmdrs. J. C. B. Tinling and R. D. Williams, supporters of Whittle, formed Power Jets, Ltd., and the following year a contract was let by the Royal Air Force for the production of an installation model of Whittle's engine. Whittle was detailed to the factory to serve as advisor. In 1939 a contract was let to Gloucester Aircraft Company, Ltd. for the design and construction of an airplane suitable for this new power plant. By May, 1941 the engine and aircraft had been completed and were ready for the first test flight. Flight Lieut. P. G. Sayers, chief test pilot of Gloucester Aircraft made the first successful flight in May, 1941. In July, 1941, five months before we entered the war, information on the project was forwarded to General Arnold of the U. S. Army Air Forces, who expressed great satisfaction with the possibilities and practicality of the device. He directed that officers be detailed to study the new engine and a research program, shared by the Royal Air Force, the Brit-

(Continued on page 43)

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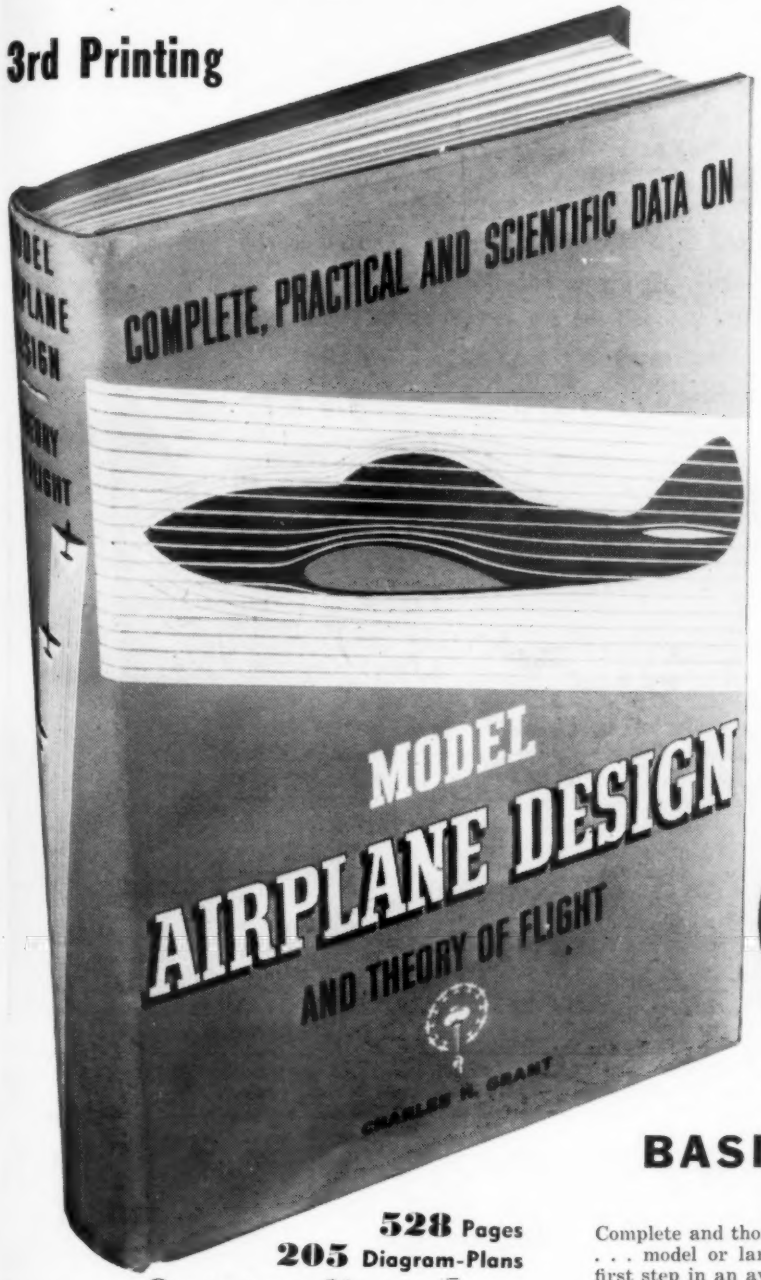

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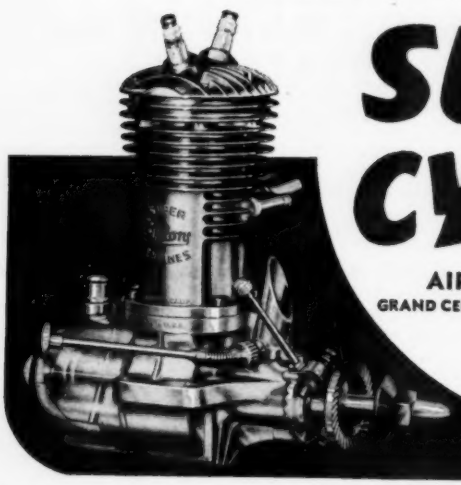
As previously announced, the manufacture of the SUPER-CYCLONE was suspended in April, 1942, for the duration of the war. We have no more engines for sale. The resources of this Company and affiliated Companies are devoted to the winning of our peace. When this is achieved, our engineers will again develop the same high-quality engines we have manufactured in years past.

While, during this period of suspended manufacture, we cannot render to you engine-owners our customary engine repair service we still have many of the replacement items in stock. Send for your copy of our up-to-date Parts List and keep your present Cyclone in service.

TODAY—the makers of SUPER-CYCLONE engines are heavily engaged in war production and aviation maintenance requiring superior craftsmanship and precision. However, when the war is won these same high-quality improved engines will again be available.



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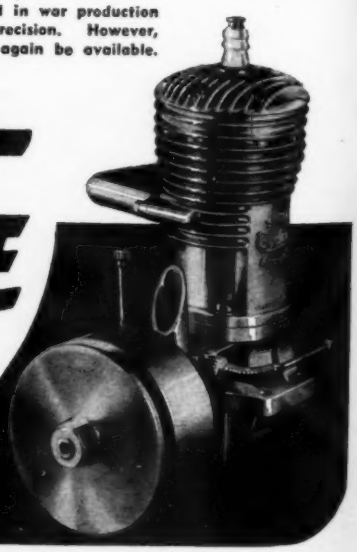

HOW AVIATION-MINDED ARE YOU?

A Vital Message to "AIR-CONDITIONED" People!

It must be apparent, even to the least discerning among us, that the world is on the threshold of a rapidly-developing air age, with virtually no limits to advancement in aviation of the future. But the question is, has the significance of this situation been brought home to YOU.

Perhaps your own personal enthusiasm for aviation leads you to believe you are sufficiently air minded. What about checking on yourself, to make sure? Until you do something more than merely become excited over aviation possibilities, you definitely are not "air-conditioned." You've got to prepare yourself. You've got to be ready to Act when opportunity presents itself.

In common with other intelligent people you can visualize what's going to happen in aviation. Well, what do YOU propose to do about it? Are you going to stand idly by and content yourself with feeling strongly about it? Or do you propose to equip yourself to play an important part in the inevitable development? Are you determined to get the best possible technical training—AND TO DO IT NOW?

CURTISS-WRIGHT TECHNICAL INSTITUTE, recognized as one of the country's outstanding Aeronautical Schools, offers you the best to be had in the way of specialized training in Aeronautical Engineering and Master Aviation Mechanics.

Since the founding of this institute in 1929, its unwavering objective has been to prepare young men to advance in aviation; to qualify them to assume increased responsibilities; and to enhance their earning power. Today this particular training is more than ever valuable. Aviation needs and will continue to need trained, highly skilled men.

The practical value of this up-to-the-minute training has been demonstrated and proved time after time by the success of thousands of Curtiss-Wright Tech graduates and by the constantly increasing demands for this service. What the institution has done for others it can do for you.

If you are indecisive about where to go for the training you require, consider this. Mr. Donald Douglas, president of Douglas Aircraft Company, wanted his son to have precisely the schooling and training you contemplate. Naturally, the boy could have been sent anywhere the father decided upon. Outstanding merit of the school was the only consideration. And where did Mr. Douglas send his boy? The answer is easy—CURTISS-WRIGHT TECHNICAL INSTITUTE.

Time and tide, it is said, wait for no man. Don't delay. Act now. Get your essential training at CURTISS-WRIGHT TECH. . . . Send coupon TODAY . . . It will bring illustrated catalogue . . . Free . . . No obligation.

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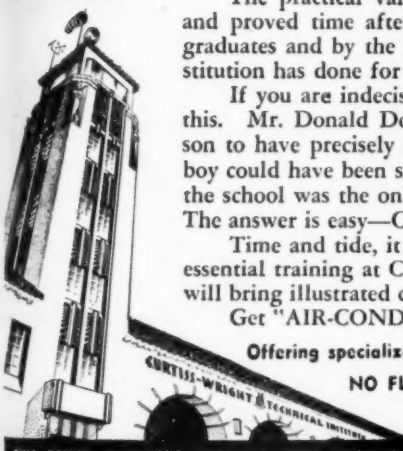

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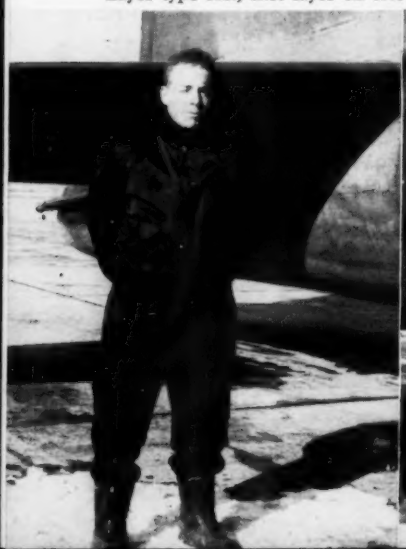
Fashions for SKY WARRIORS

by DOUGLAS INGELLS

Layer type suit, first layer on left and complete costume on right with parachute



SOMETIME ago a small group of huddled figures sat in the big cold chamber, a tank-like affair, at Wright Field and analytically studied a galaxy of quivering dials and instruments between short gasps of oxygen. Grotesque-looking behind their goggles, oxygen masks and helmets, these men were testing the Army's latest electrically-heated clothing for combat pilots, who fight in the great new battlefield eight miles above the earth where frost-bite is as dangerous as an enemy bullet.

Inside the cold room the temperature dropped to minus sixty degrees, as cold as the coldest cold of severest Arctic freezes. The men moved about, changed chairs, scribbled brief notes on little paper pads and talked to each other with the same ease as though they were in a warm parlor. They played poker, dealing from the deck with gloved hands

Lockheed *Lightning* pilot completely outfitted with flotation suit, parachute and oxygen mask. Suit is worn for overwater hops

warmed by a maze of tiny wires, while little snow-white crystals hung from the beards on the one-eyed jacks. They ate sandwiches with quick, choppy bites, not daring to expose their lips. Water froze in their cups before they could pour it so they drank hot cups of precious coffee.

Eight long, tiresome hours they sat inside this huge ice box which you might compare with the one in your kitchen except theirs was five times colder. This was the longest test on record and the new equipment proved so effective that engineers and designers now are developing garments in quantity for our sky soldiers who fight their battles in the extreme cold of high altitudes.

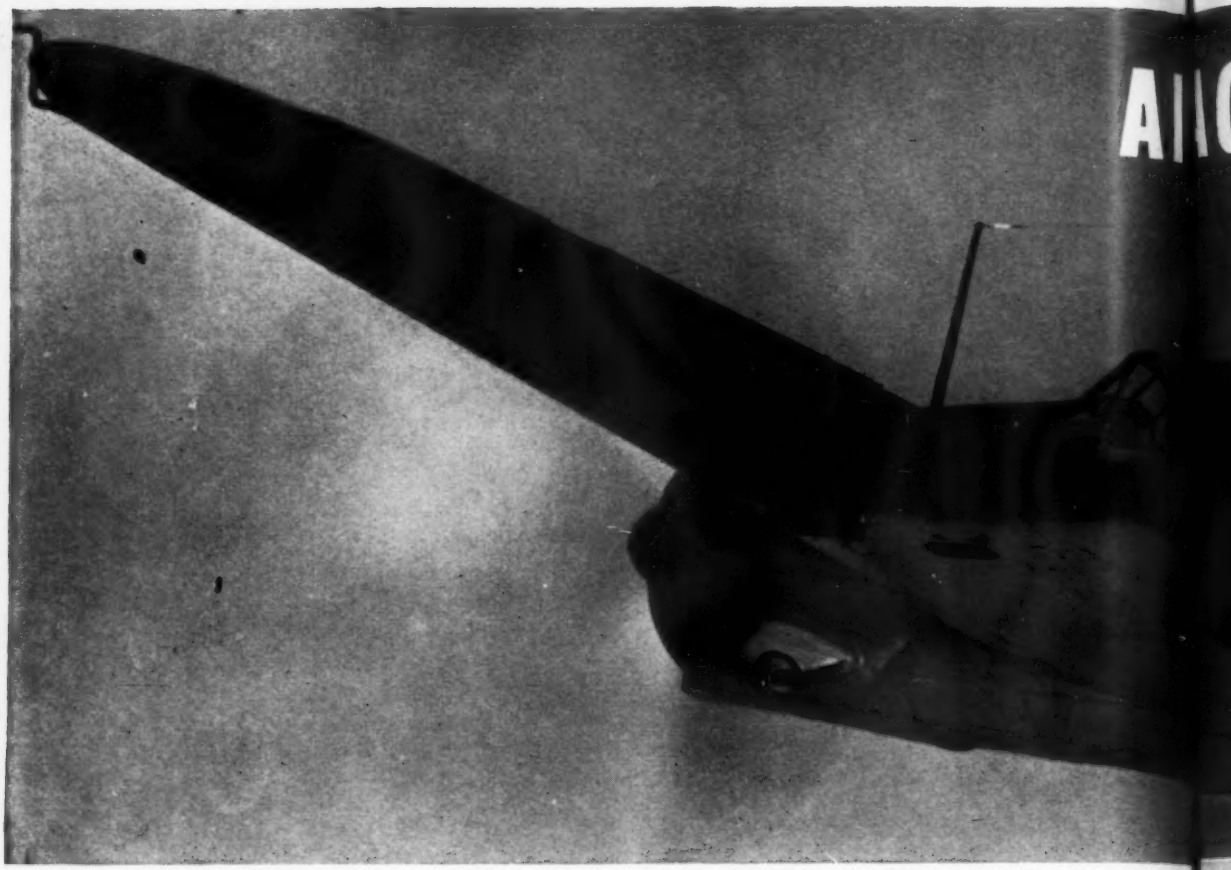
Such exploits you seldom read about, yet year in and year out since the last war and before, civilians and army men alike in the big Equipment Laboratory at Wright Field near Dayton, Ohio (where the Wright Brothers built the first airplane) have braved the cold in test chambers on the ground and risked their necks in the sky to determine the best kind of clothing, most comfortable, easiest to wear, most flexible, warmest and lightest to make our airmen the world's best dressed personnel.

Men had to die before they realized what was wrong. They went up in the sky where it was blue and clear and cold and the air was thin and scarce. They sucked oxygen through crudely fashioned tubes before they designed an automatic breathing device that covered their face and kept them breathing whether they knew it or not. The Collier Trophy in 1940 was awarded for the development of this device. They froze their eyeballs in their sockets. Their hands turned purple and white. Their feet were numbed. Yet, steadily they pushed the ceiling upward to 30,000 feet, then 40,000 feet and now they are going high into the stratosphere where modern air war is being fought and won.

The men who did this you haven't heard much about. They are the unsung heroes—Macready, Foulk, Harris, Gray, Kelly, Soucek, Collier, Adam and Greene, and the hundreds of others who worked with them on the ground, satisfied their clothing needs and made it possible for them to push their wings higher toward the heavens. Like Lindbergh, Chamberlain, Musick, Earhart, Post, Kingsford-Smith, Howard Hughes —the globe shrinkers with whom you are familiar—these men have brought the earth nearer to the sky. They did it by putting the proper clothes on our air-

(Continued on page 36)

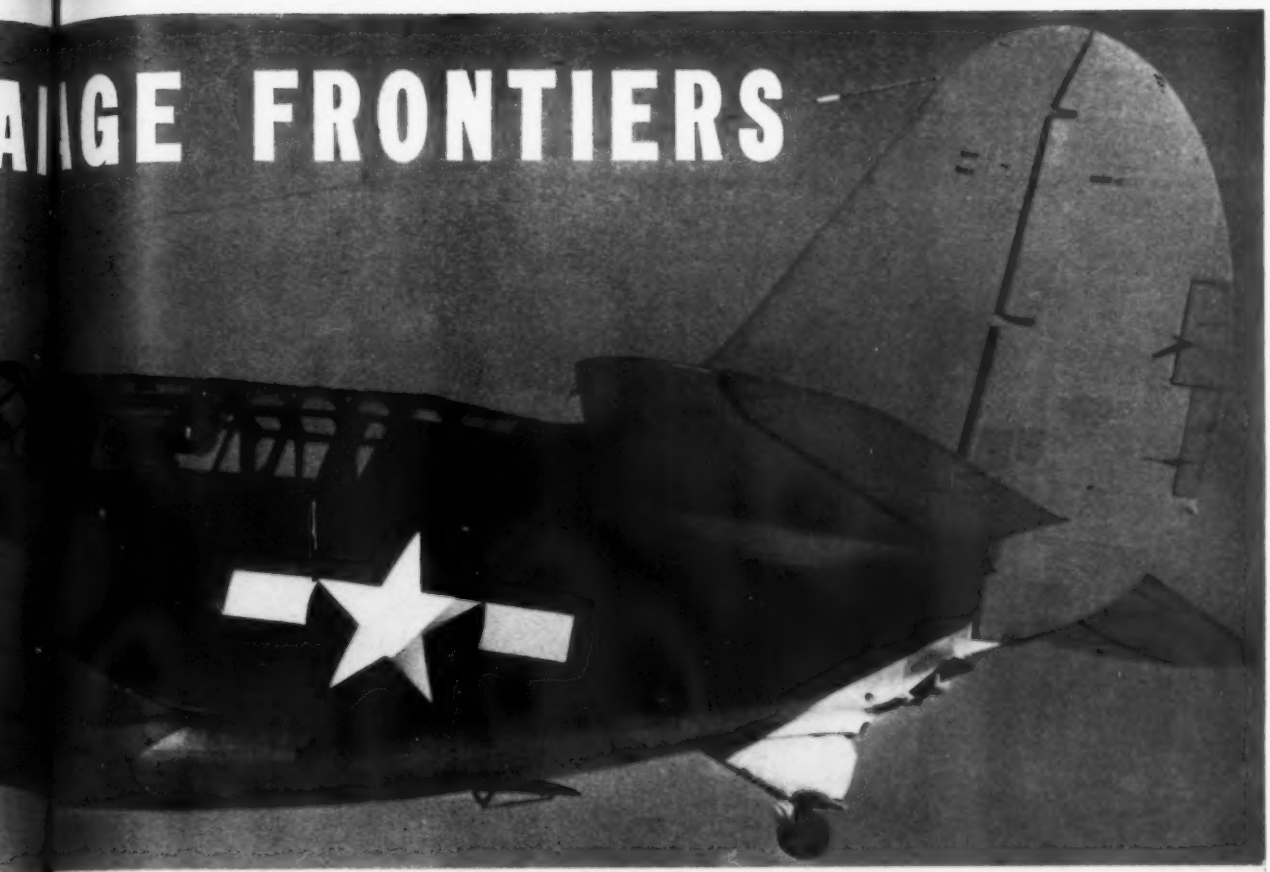
Flotation suit, sheep shearling undergarment and overcoat and flotation jacket hood



Curtiss SB2C-1 *Helldiver* has at last gone into action and early reports pronounce it a success. Powered by a Wright GR-2600, 1750

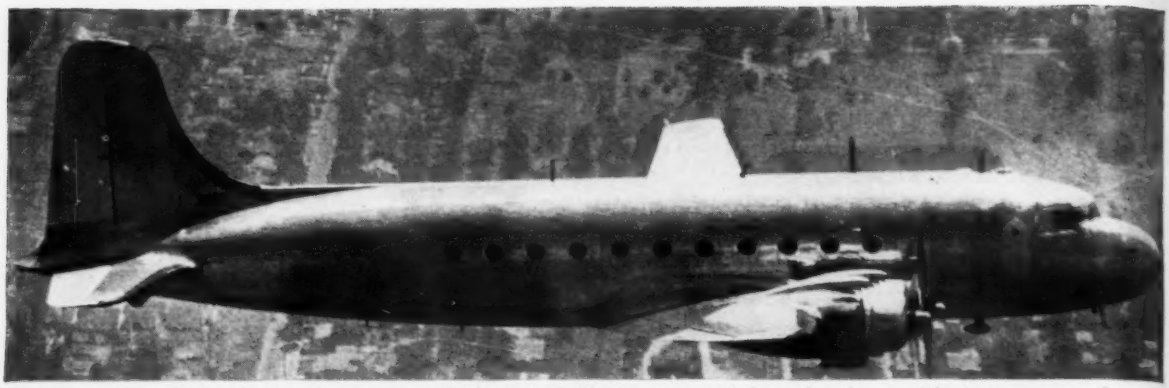
Hawker *Hurricane* IIC night fighter is armed with four Hispano 20 mm. cannon. Merlin XX develops 1185 hp giving top speed of 3

AGE FRONTIERS



Westland *Whirlwind* Mk. I mounts two 250-lb. bombs under wings in addition to powerful battery of four 20 mm. cannon in nose

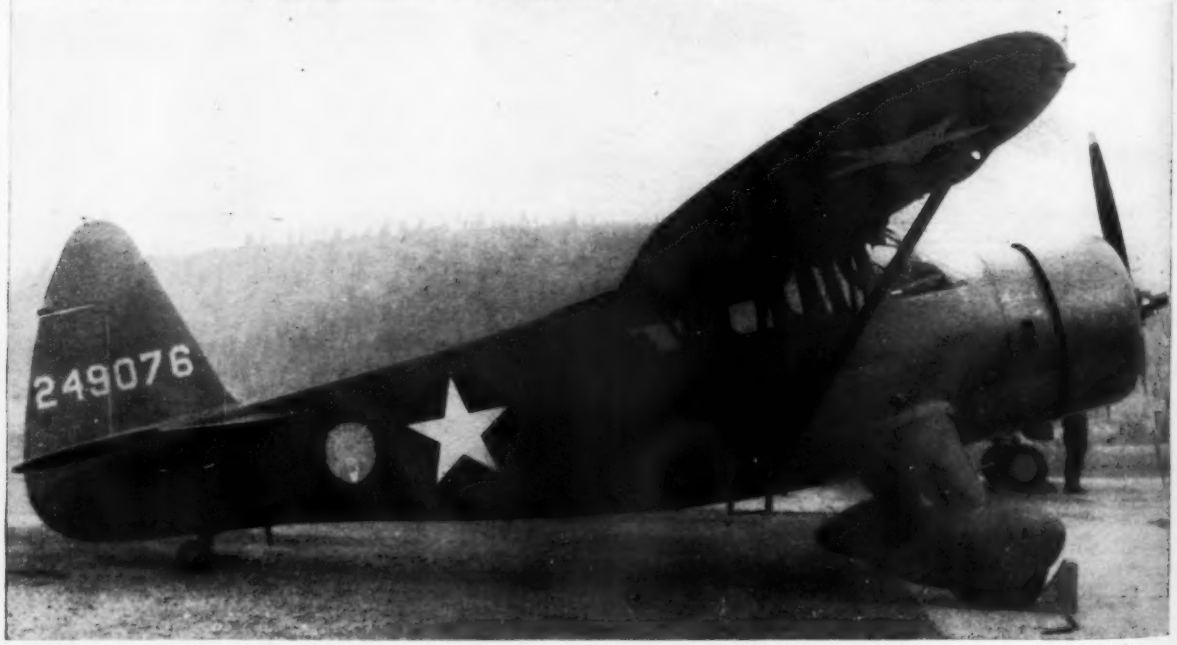
Lockheed *Lightning* Mk. I first used by British has no turbos. Both props are right hand. Now A.A.F. trainers, they are P-322



Here's a preview of what the Douglas *Skymaster* C-54 will look like in commercial dress after the war. The 30-ton monster does 265

Clasping their hands in a 3-way handshake (l. to r.) Orville Wright, Jesse Jones and General Arnold, who was awarded the Collier Trophy (left) for "greatest achievement in aviation." Occasion was the 40th Anniversary of first flight by the Wright Brothers

Brig. Gen. Ben W. Chidlaw, first Army pilot to fly jet-propelled plane, says the new ship has no vibration. See page 2



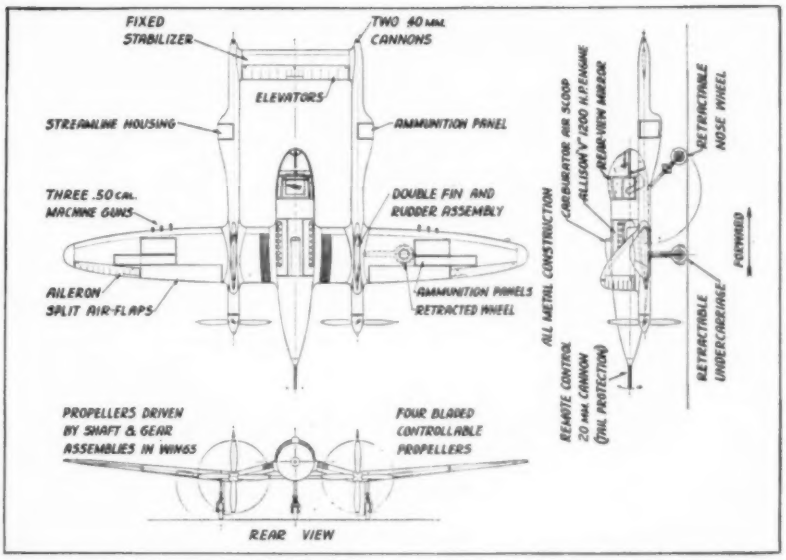
Benny Howard's famous *Mr. Mulligan* in war paint! Known as the Army C-70B, it is powered by a Jacobs L-6, 300 hp. The old racer has changed but little since it won the 1935 Bendix Trophy Race covering 2,050 miles at 239 mph average

DESIGN FORUM

Analysis and discussion of ideas submitted by readers

THE tremendous response to the Design Forum has been gratifying indeed, but has posed a problem. Naturally, it is quite impossible to publish even a small percentage of the submissions.

What we are trying to do is print typical examples of designs received. It is rather interesting to note that these drawings normally fall into two or three broad categories; we comment on the best and most representative types submitted of each class. Therefore, to those of you who have not seen your drawings in print, we suggest you compare your design with those published. Our comments on a particular design are applicable to all designs of a similar type; if your drawing compares in layout closely with those shown here, please accept these notes as an analysis of your design also.



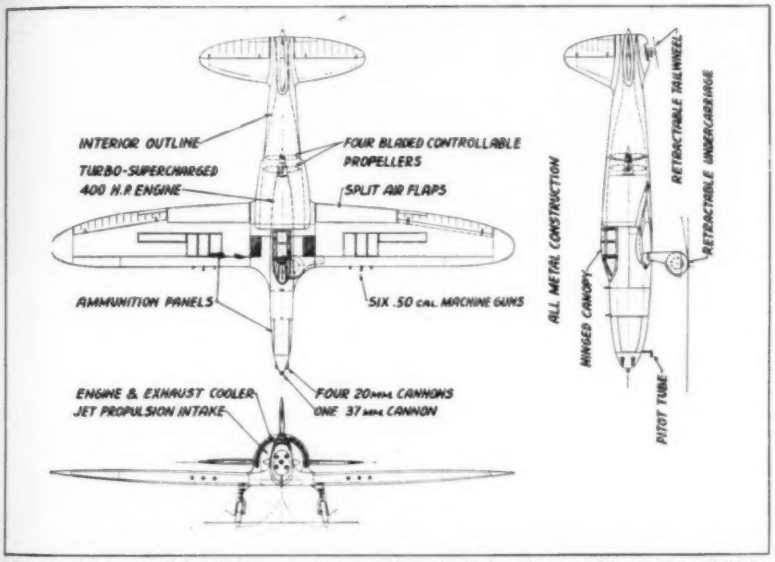
No. 1 One of the most original designs ever submitted. It is the work of Ernest Budke

Ernest Budke sends in Design No. 1 and, in appearance, this is one of the nicest looking types we received. Installation problems have been worked out rather neatly and the various component parts arrangement work in well with required items of equipment.

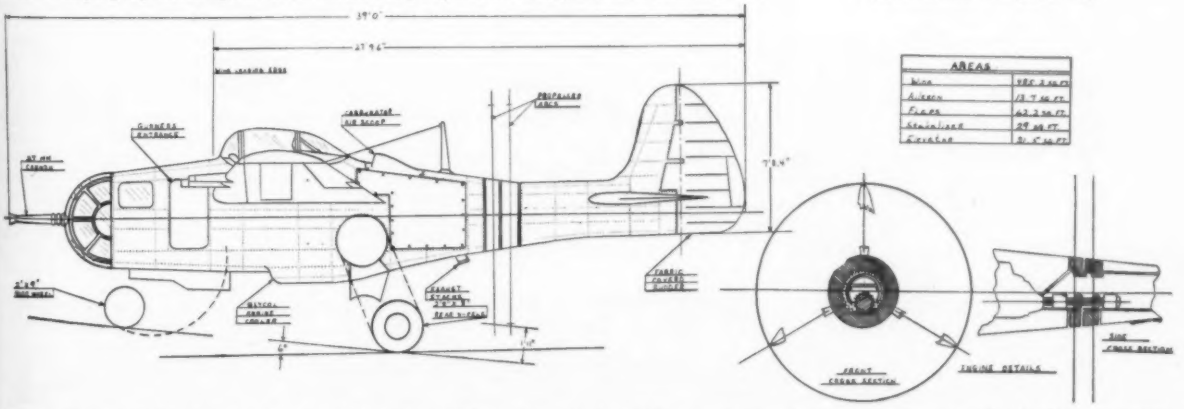
In an analysis of the canard or "tail-first" design, several problems are immediately presented which all but prohibit its use in modern high-speed application. Longitudinal stability is one of the most critical problems in aircraft design. Lateral stability is normally inherent in most designs by the symmetry of weights and areas about the plane's vertical centerline. Directional stability can be conquered rather easily by proper location of vertical tail surfaces and Mr. Budke has quite wisely located the vertical surfaces in his design aft of the c.g.

However, longitudinal stability is almost impossible to achieve in the canard since there are no inherent dampening moments set up. When a gust throws the canard out of longitudinal balance, an oscillation of the nose surfaces begins. This quickly increases until a positive pitch results in a stall, thereby destroying the airplane's flight. The horizontal surface is quite easily stalled in the canard and once stalled it completely loses its

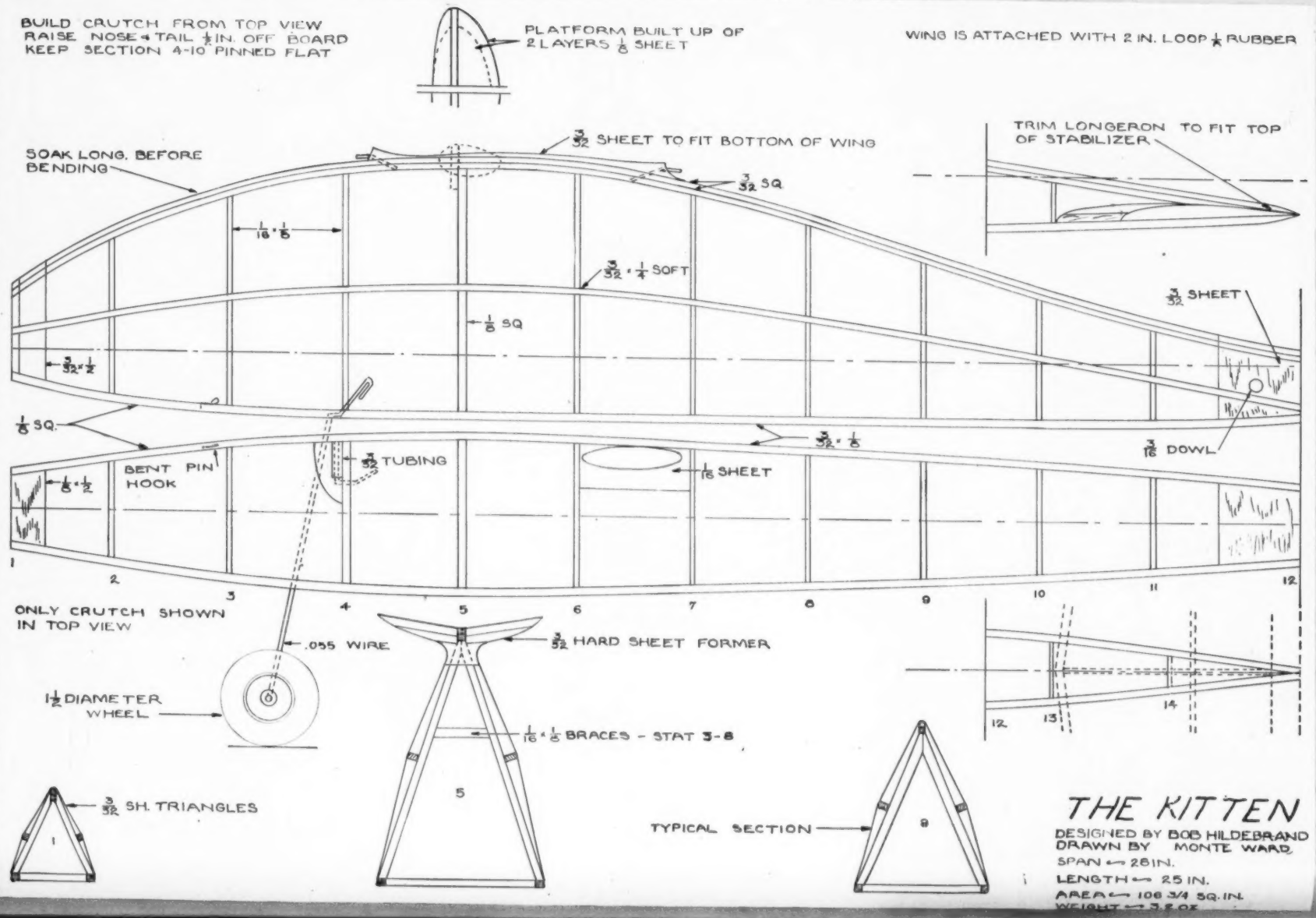
(Continued on page 48)



No. 2 A jet propulsion fighter of advanced design by Robert Ronay of Staten Island, N. Y.



No. 3 George E. Taylor, Jr., sends in this unique fighter plane design with novel propeller arrangement on aft fuselage structure


BUILD CRUTCH FROM TOP VIEW
RAISE NOSE & TAIL 1/2 IN. OFF BOARD
KEEP SECTION 4-10 PINNED FLAT
PLATFORM BUILT UP OF 2 LAYERS 1/8 SHEET
WING IS ATTACHED WITH 2 IN. LOOP 1/8 RUBBER
SOAK LONG. BEFORE BENDING
3/32 SHEET TO FIT BOTTOM OF WING
3/32 SQ
1/16 x 1/8
3/32 x 1/4 SOFT
1/8 SQ
3/32 x 1/2
1/8 SQ.
BENT PIN HOOK
1/8 x 1/2
3/32 TUBING
1/16 SHEET
3/32 x 1/8
TRIM LONGERON TO FIT TOP OF STABILIZER
3/32 SHEET
3/16 DOWL
1
2
3
4
5
6
7
8
9
10
11
12
13
14
ONLY CRUTCH SHOWN IN TOP VIEW
.055 WIRE
1 1/2 DIAMETER WHEEL
3/32 HARD SHEET FORMER
1/16 x 1/8 BRACES - STAT 3-8
3/32 SH. TRIANGLES
TYPICAL SECTION
THE KITTEN
DESIGNED BY BOB HILDEBRAND
DRAWN BY MONTE WARD
SPAN — 28 IN.
LENGTH — 25 IN.
AREA — 106 3/4 SQ. IN.
WEIGHT — 3.5 OZ

The KITTEN

by BOB HILDEBRAND

Here's a 100 sq. in. job with Wakefield performance

AYE there, laddie, arre ye Scotch we' th' rubberrr? If you are the kind who doesn't appreciate the idea of using 1-1/2 to 4 ounces of rubber in a model only to see it drift away, we bid you look over—the Kitten. Although the Kitten has flown away and will continue to do so, added side area makes the model visible longer; and if the Kitten is lost, it has carried only 3/4 ounce of the precious elastic away. Wing area is just over the 100 square inch minimum; so the ship doesn't require much rubber to claw itself sky high.

Placing in every contest entered, even against Wakefield and 300 square inch jobs, is proof the Kitten is no slouch on performance. Hundred square inch models have several advantages over larger models. Great strength-weight ratios and fast high climbs are outstanding characteristics. Flight tests have proved the Kitten's 2-1/2 minute average many times. But enough of this gab. Let's start construction.

Fuselage: Scale up the fuselage top view. With each of two hard strips of 1/8" square balsa, sand the opposite sides to 3/32" x 1/8", except for 3" at one end which is tapered *up* to the original size. Pin these two strips to the top view and glue the 1/16" x 1/8" hard crosspieces in. Cut the other cross members to size and cement in place. Keeping the portion between stations 4 and 10 pinned flat, elevate the front and rear portions of this crutch 1/2" from the board. Make the two jig pieces A and B from 1/8" x 1/2" balsa. When these two jigs are cemented perpendicularly to the nose and rear dowl stations they look like inverted T's from the front view, making a pinning surface for the top longeron. Cut 1/8" square uprights from a scaled up view of station 5 and glue in place. Repeat for station 9, using 1/16" x 1/8" wood instead. Soak a piece of 3/32" square in hot water and pin to the jigs and uprights. When dry, cement to the uprights and add most of the remaining braces. With a harder piece of 3/32" square repeat the procedure. Finish off with the remaining uprights and then add the stringers. Small triangles of 3/32" sheet facilitate covering at the nose.

From hard 3/32" sheet cut the wing mount former and cement firmly in place. The platform of two layers of 1/8" sheet is added and sanded to make finished, streamlined ears. Cut 3/32" sheet to fit top of fuselage and bottom of wing, and glue in place. Wing rubber hooks of .028 wire are now added.

The landing gear should be bent from .055 or 1/16" wire. Bind and cement the 3/32" O. D. brass tubing bearing to the fourth cross piece and add the gusset. Bearings for the 1-1/2" wheel are two washers, while the wheel is retained by a drop of solder.

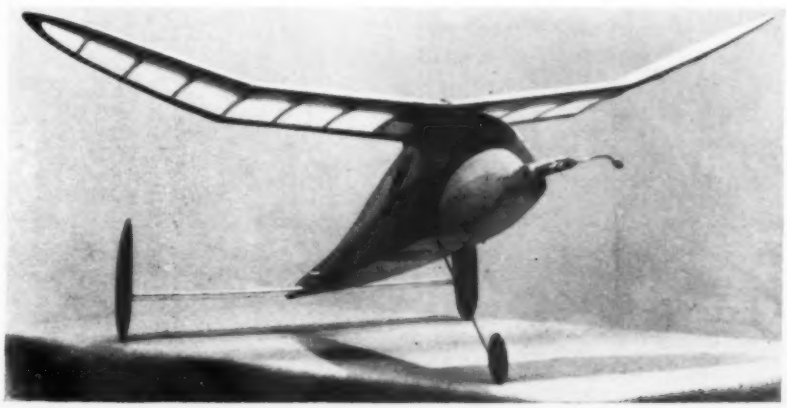
Tail: The leading and ready tapered and notched trailing edges are laid out and 1/4" deep ribs of medium hard balsa are cemented in place. When these joints are dry add the spar and gussets. Now taper and sand down the ribs to an airfoil section.

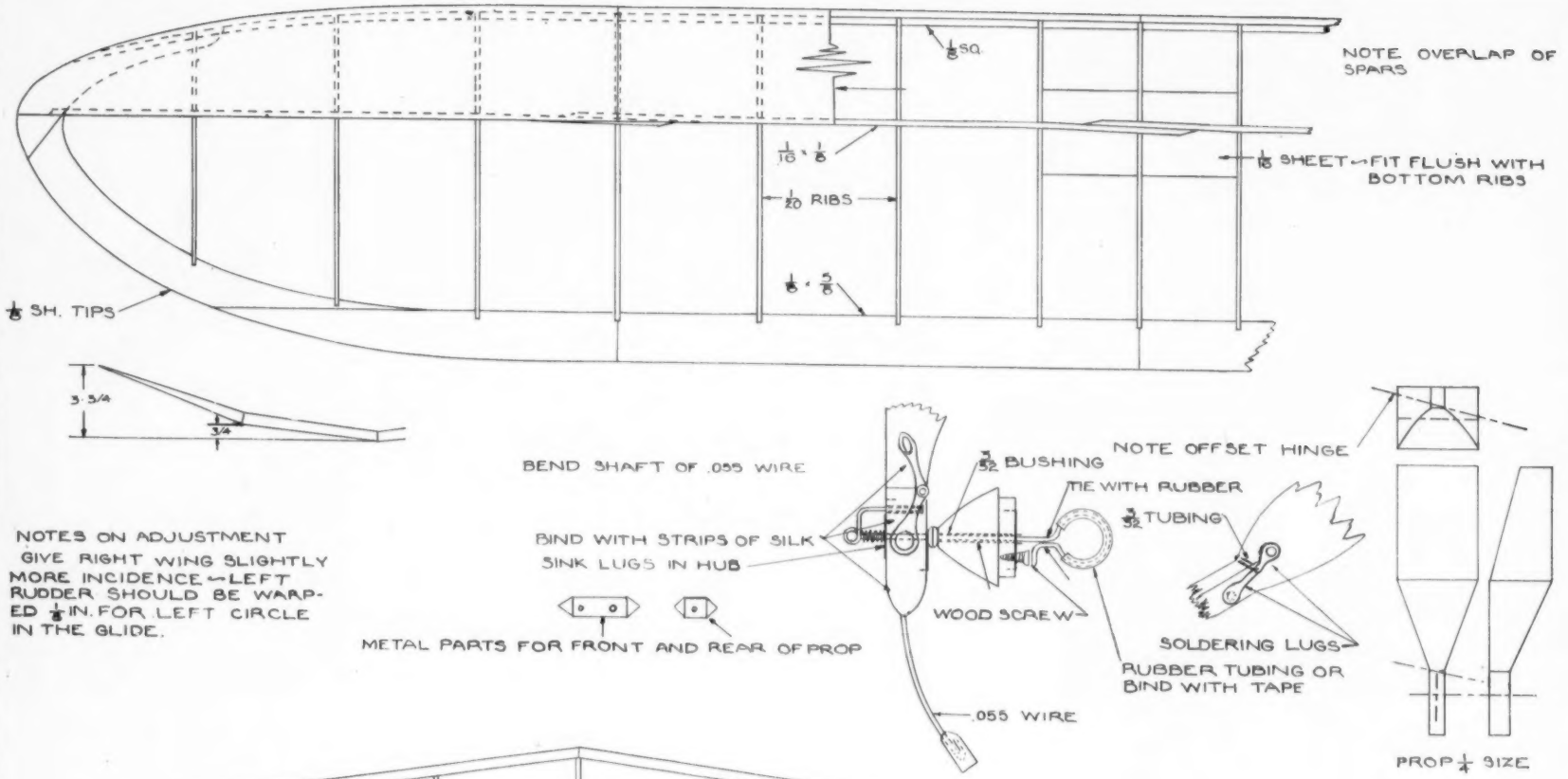
Rudders are cut from soft, quarter-grained 1/16" sheet and sanded to a very streamlined crossection.

Wing: Cut 15 wing ribs of 1/20" sheet and the tip pieces from 1/8" sheet. Cement the entire wing outline together and add all ribs. Glue spars to all but the three polyhedral ribs. When dry carefully crack leading and trailing edges and block up to proper angle, thoroughly cementing joints and spars. Sand smooth a sheet of 1/32" balsa. After all other joints are dry, cap the leading edge of the wing.

Prop: Efficiency is greatly enhanced by a smooth blade; so after carving, sand the prop with varying textures of sandpaper, decreasing to almost 10/0. With a mixture of dope and talcum powder, dope and sand the blade a couple of times . . . (go over all exposed wood parts with this mixture). Clear lacquer is used on the finishing coats. Attach folding mechanism of lugs and 3/32" tubing with glue and strips of silk or thread. Solder the tubing to the outer two lugs, which are attached to the blade; the inner lugs form the bearing. Cut out the nose plug and cement a bearing firm-

(Continued on page 46)

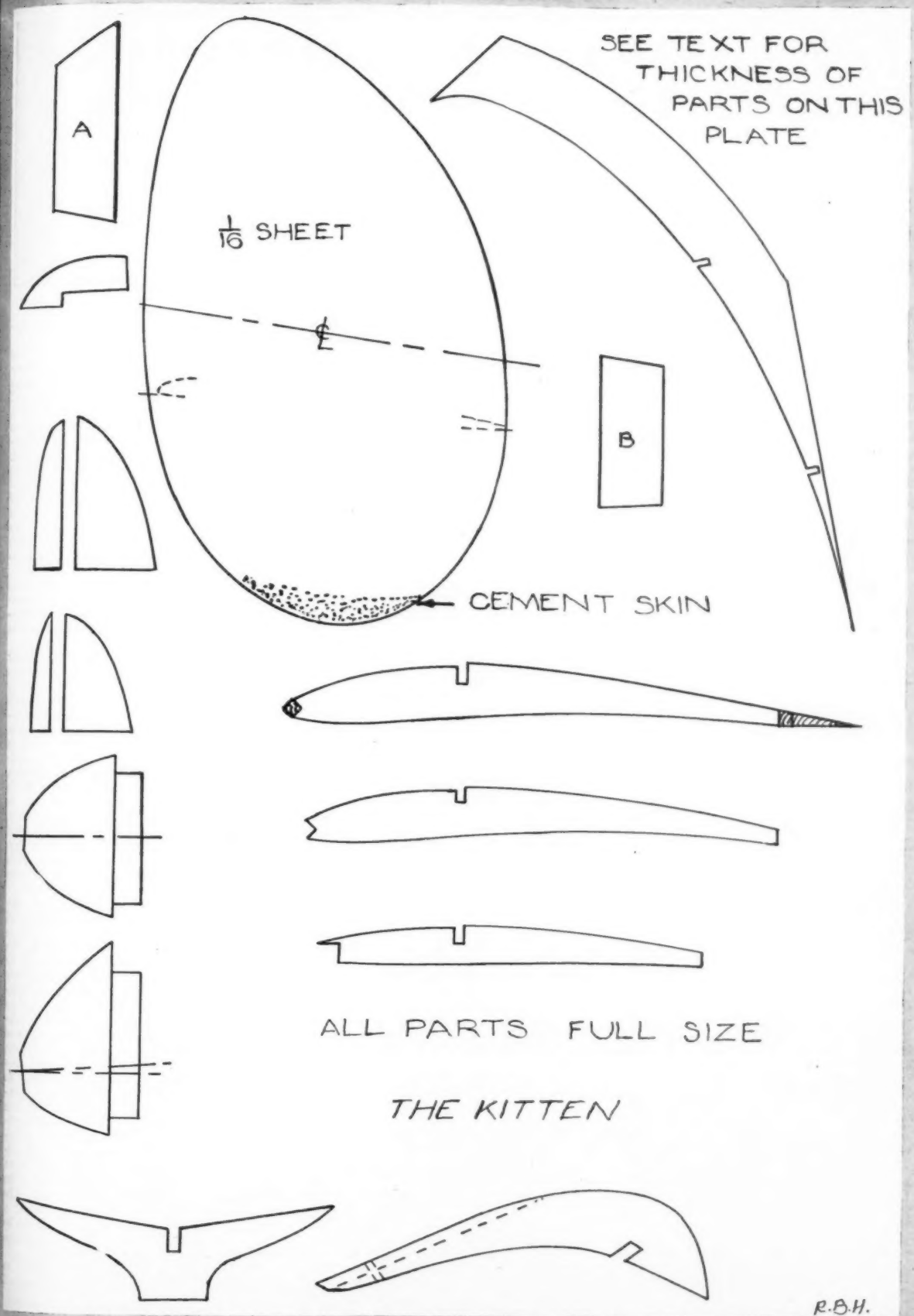




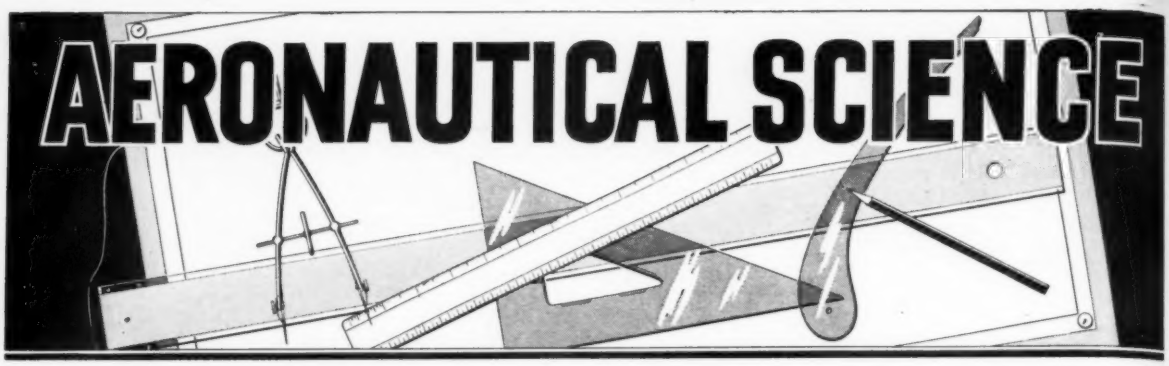
THE KITTEN

SCALE 1/2" = 1" EXCEPT AS NOTED

BOB HILDEBRAND


SEE TEXT FOR THICKNESS OF PARTS ON THIS PLATE
A
1/16 SHEET
B
CEMENT SKIN
ALL PARTS FULL SIZE
THE KITTEN
R.B.H.

AERONAUTICAL SCIENCE



WE ARE always highly amused at frequent references in aviation fiction stories to pilots leaping into their planes and roaring into the air in mad chase of a scoundrel, with just such ease and simplicity of procedure. The more conservative writers make a brief reference to starting the engine but this is invariably followed by the hero's "slamming the throttle against the quadrant" and forthwith zooming to 20,000 feet in zero seconds flat! Perhaps a brief discussion of the bare essentials necessary for start warm-up and climb of a modern military airplane might serve to emphasize the high degree of training and intelligence required of a pilot in the operation of his fighting machine.

Preparation for starting an aircraft engine for the first flight of the day actually begins the preceding day after the final flight. Prior to closing the throttle the pilot presses the *oil dilution switch* for a few seconds when cold weather is indicated for the following morning. This switch introduces gasoline into the oil "in" line of the engine, thereby thinning the oil and decreasing its viscosity. This fuel is burned within the engine leaving the lubricating oil unaffected.

One: First step is to clear the engine of fuel and oil. This is accomplished by making sure the *ignition switch* is "off" and turning the propeller by hand through four or five revolutions. If either is present the lower spark plugs should be removed and the fuel and/or oil removed; for, should the engine be started with such excess volatile fluids resulting violent explosions might cause bent or broken piston rods and badly scored cylinder walls.

Two: To provide engine fuel, the *fuel cock* must be turned to the tank desired. On some tanks a reserve supply is maintained through the use of a standpipe through which fuel is drawn off for normal supply. The *selector valve* is moved to "reserve" on this type tank. In twin engine airplanes, which normally have *cross-feed valves* to supply fuel to both engines from a single tank, this valve is in the "off" position to prevent fuel being pumped into the unstarted engine, thereby causing excessive fuel. Fuel pressure is obtained either by hand or electrically operated *booster pumps*. Low pressure (float carburetor) fuel systems require pressure of 3-4 pounds, brought up by the hand fuel pump. High pressure, (injection carburetor) systems demand 13-15 pounds fuel pressure brought up by turning the *booster pumps* to "low". These pumps are located in each tank and serve to "push" the fuel up to the carburetor. Then it is "pushed" into the intake manifold and "pulled" on into the cylinders by the impeller.

Three: In warm weather the engine cowl flaps are opened; in cold weather they must remain closed. On planes equipped with engine shutters, accessory cowl flaps, etc. these same rules apply.

Four: Propeller controls are placed in low pitch (high r.p.m.) position which places the smallest possible load on the engine during its starting period.

Five: Mixture controls are placed in "idle-cut-off" position. The *throttle* is "cracked" or opened about 1/10 its full travel.

Six: The engine *master switch* and *ignition switch* are turned "on". When it is ascertained all personnel is clear of the propellers, the starter *energize switch* is turned on. When the starter flywheel reaches maximum speed (as indicated by the pitch of the noise) the *engage switch* is pushed and the engine begins to turn.

Seven: Simultaneously, the *primer switch* is held down. This injects raw fuel directly into the cylinder heads to assist starting. The primer is not held down more than two or three seconds (depending on temperature conditions) as over-priming results in engine flooding with attendant delays and hazards.

Eight: As soon as the engine "catches" the *mixture control* is moved to the "auto-rich" position, insuring a rich mixture automatically delivered to the engine.

The engine has now been started and preparations are made for the warm-up period and accompanying ground-operating tests.

First: The *oil pressure gage* must be watched closely and if it does not register a pressure within 30 seconds the engine is stopped immediately, as this indicates that moving parts are not being lubricated. An examination is made. If pressure is indicated the *throttle* is moved forward slightly until the engine is turning up from 600 to 1,000 r.p.m. (Some high compression engines will not idle at less than the latter figure.) This speed must be held until the *oil pressure gage* reads at least 40 psi. Then the warm-up is continued.

Second: Oil temperature gage is next closely watched to ascertain that the engine is heating the oil and thereby getting proper lubrication. This gage reads at least 140° F. before continuing with the warm-up.

Third: Ignition system is checked by switching off one *magneto* (thereby operating the engine on only one of the two sets of spark plugs.) The drop in r.p.m. should not exceed 100 when operating on either *magneto*.

Fourth: Propeller operation is checked by placing it in "high" pitch and then back in "low" pitch and noting corresponding changes in engine r.p.m. With constant-speed propellers this check is made with controls in the "manual" position.

Fifth: The fuel system is checked next by switching from one tank to the other in rotation, ascertaining that all tanks supply fuel and *selector valve* and *fuel cock* linkage are in good operating order.

Sixth: Supercharger controls are next operated from low blower to high blower and then back into neutral. This check requires that each blower be allowed to operate for a few minutes; too rapid shifting results in accumulations of sludge and dirt. However, the *manifold pressure gage* must be watched closely to avoid dangerous pressures; this gage indicates the correct operation of supercharger controls.

Seventh: Before proceeding to the runway the *surface control lock* must be released, *parking brakes* released and engine cowl flaps opened wide to prevent over-heating the engine.

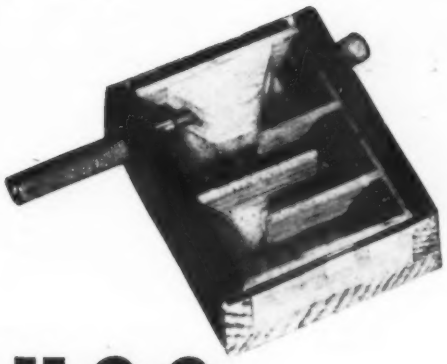
Eighth: Prior to taking the proper place at head of the runway *brakes* must be set and full-throttle test given. This involves "revving" up the engine to full horsepower and r.p.m., visual observation of flight control operations and setting of various mechanisms, viz: *flaps* about one-third down, *trim tabs* in neutral or as previous experience dictates, *safety belt* secure, *propeller controls* in "low" pitch, *mixture control* in full or auto-rich and *oil pressure, fuel pressure, oil temperature, engine cylinder head temperature*, etc., must have certain specified readings. Takeoff run is then begun and the airplane is taken into the air.

Thus, preparation for getting an airplane into the air requires a great deal more than simply starting the engine and hitting the throttle. Prior to the above procedure being carried out by the pilot, the crew chief and flight crew have given the plane a complete preflight inspection, serviced fuel, oil, hydraulic, compressed air, oxygen and armament systems, signed the ship out and filled out complete required records, the pilot briefed on his flight, where he's going and what he's going to do. In the air the real complicacy of operation begins for it is vital that engine operation be conducted only under certain carefully prescribed conditions. Maximum and minimum readings of all indicators are painted on the dial and when these are exceeded harmful and even dangerous conditions will exist. The magnitude of the task of operating a modern combat airplane is a tribute to the skill and training of the modern combat airplane pilot and crew.

(Editor's Note: We invite inquiries to this department concerning aeronautical science problems.)

VICTORY

CLEANING STUBBORN SPARK PLUGS



Here is a simple and efficient device for conquering the problem of cleaning model spark plugs

by **RAY RUSHER**

THOSE fouled plugs that resist usual cleaning methods can be sand-blasted with this simple cleaner, similarly to automobile spark plugs at service stations and garages.

The cleaner consists essentially of a box having a glass front, several baffle walls, an air nozzle and a sand nozzle. Fig. 1 is a full size front elevation of the box with the glass omitted, and an end view of the box and glass. Fig. 2 is an isometric view of parts. Fig. 3 is a pattern for the top, back and bottom walls, together with edge views of them. Fig. 4 is a crossection of the air cleaner showing it in operation, and Fig. 5 is a pattern for the end walls and baffle walls.

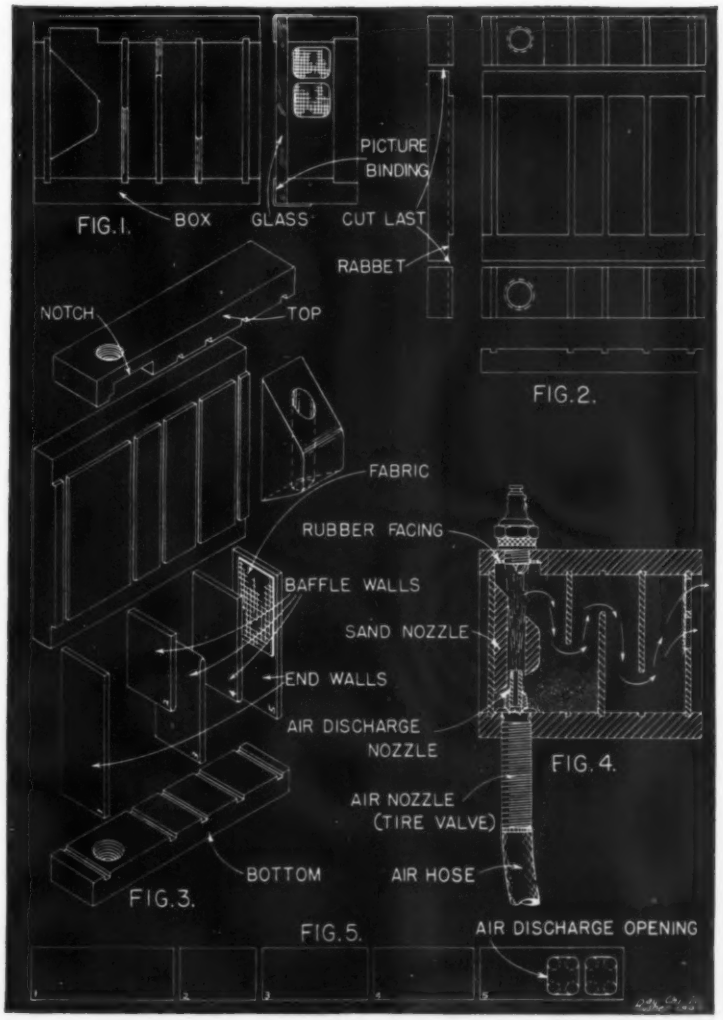
The walls of Fig. 3 are made of soft or medium pine wood 1/4" x 2-1/4" x 3". The vertical grooves are cut to a depth of 1/32" on a circle saw; parts of these grooves are not used but are cut as a matter of convenience. If the saw cuts a groove 1/16" wide, then 1/16" thick wood is used for the walls of Fig. 5. The horizontal rabbets on the back wall are cut 1/32" deep and 1/4" wide to match the top and bottom wall edges. The three walls are grooved and rabbeted all together before being cut apart at the two 1/16" spaces marked "cut last." Dimensions for various parts are scaled directly from the drawing.

Spark plug receiving hole is drilled 7/32" in diameter for V2 and V3 (1/4") spark plugs and 21/64" in diameter for V1 (3/8") spark plugs. A wide notch is cut across the bottom of the top wall so the wall is left only 1/8" thick. The spark plug points then project so you can observe if they are thoroughly clean after operating the cleaner. The bottom of the notch is faced with rubber to prevent sand-blasting the wood away; the rubber may be a piece of inner tube or a tire patch secured in position with rubber cement.

After spark plug hole is drilled force a spark plug into it, rotating the plug at the same time. Be sure to keep the plug square with the top wall. Do this carefully, so that an excellent air-tight threaded hole is produced.

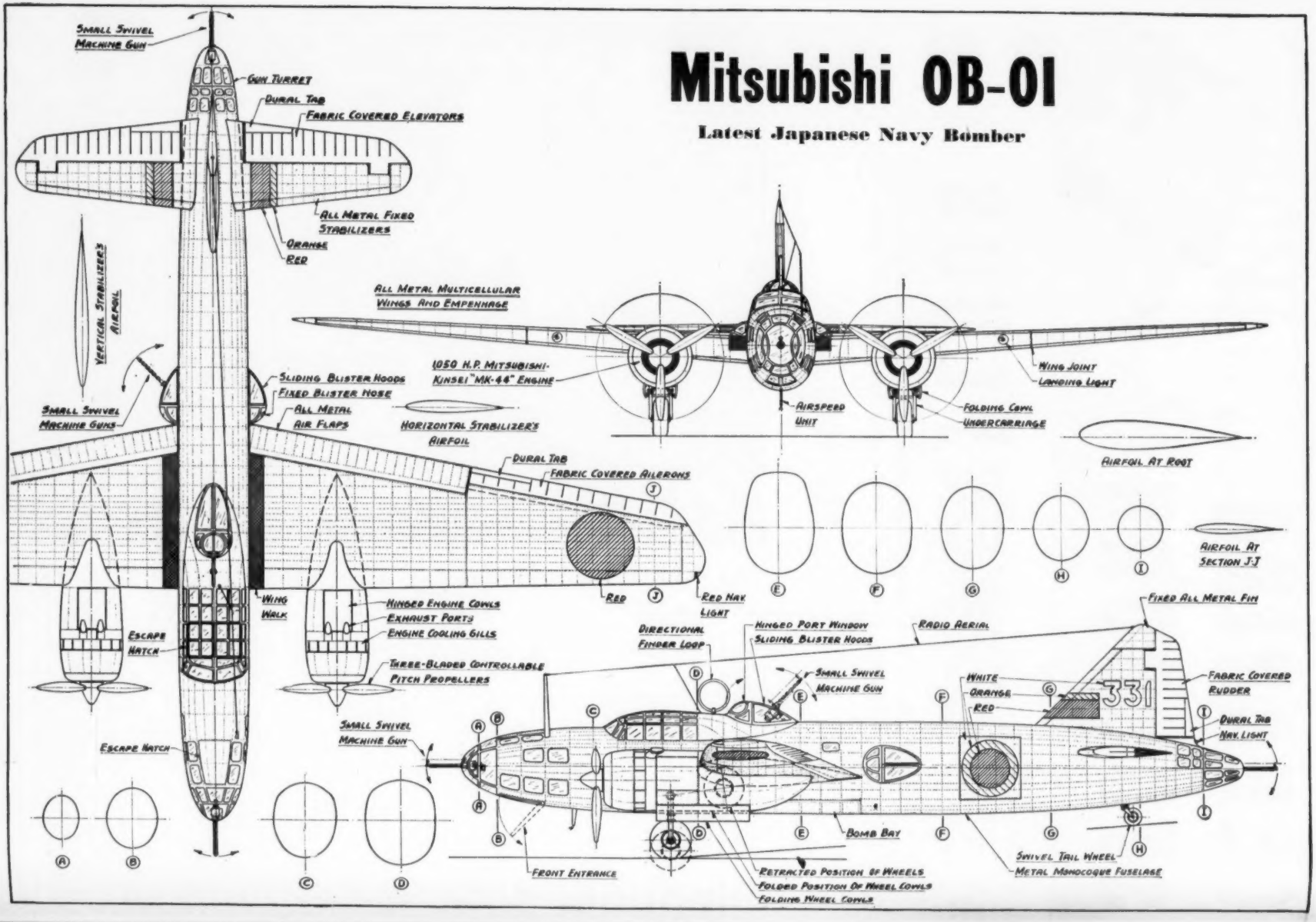
The hole for the air nozzle is drilled 17/64" in diameter and the threaded air nozzle stem is similarly used to thread it. The air nozzle is a tire valve taken from a bicycle inner tube; these vary in design and you therefore have to devise a different way to insert it air-tight into

(Continued on page 63)



Mitsubishi OB-01

Latest Japanese Navy Bomber



TOJO'S TERROR

Plane on the cover

OUR fighting airmen have learned many lessons in aerial battle against the sons of Nippon, some that have been bitter, indeed. Most lessons have not been new discoveries but the explosion of preconceived myths about the Japanese pilot, his equipment and his skill. Still others, however, have been new-borne.

The Japanese airman is very good as a flying man and exhibits greater skill than had popularly been supposed. The greatest surprise to our fighter and bomber pilots in the South Pacific was the remarkable accuracy of Japanese gunnery. Possibly the most widely publicized misconcept was in reference to the poor eyesight and consequent bad accuracy of the Japanese pilot (and naval gunner). Subsequent experiences showed this to be a fallacy; on many occasions the Japanese pilot exhibited admirable skill with machine-gun and cannon. This may be explained, at least partially, by the determination of the attacking Jap and his insistence on "closing" with his enemy. This resulted in extremely short-range firing, with its accompanying increase in accuracy.

While we would hardly describe the fatalistic Jap as a "brave" man, he, nevertheless, does have an unbelievable courage (or lack of imagination, if you will) in coming to close grips with his enemy and in braving murderous fire to attack his man. Of course, the Jap's religious fanaticism and his firm belief that "to die for the Emperor is to live forever!" is the most logical explanation of this trait among his warriors. But it has trebled, even quadrupled the problem of defeating him. It has metamorphosized what we believed to be a quick victory into an almost intolerably difficut job of beating the Japanese.

Again we were wrong in our estimate of Japanese production and design and, perhaps, we have overdone the standard accusation of the Jap as an incurable imitator. The latest Japanese military airplanes cannot be too closely compared with any other existing design nor can his engines. On both of these counts he has exhibited an originality and an engineering experience and skill at least comparable with our own. Subsequent examination of the famed Mitsubishi 00 Zero shows it to be far from our original cursory dismissal of it as a fighting plane. We must admit that in one or two respects, it is actually superior to our own planes of a similar type.

Production has risen steadily in Japan as the difficult business of civilian mobilization proceeded at a pace likened to our own. Estimates of Japanese aircraft production have risen from 200 per month, to 400, to 800 and, according to the latest estimates, to 1,000 planes per month. Losses, however, are almost as high and it is believed that replacement occupies the major deliveries of planes to the various fronts.

It will be of interest to note that all of the major nations, friends and foes alike, had a hand in the aeronautical education of the Jap. In 1911 Lt. Kimura and Lt. Tokuda of the Imperial Japanese Navy took flying instruction in France, They were killed in 1913 in the crash of a Bleriot machine. In 1912 Japanese students studied in the United States and Kiyoichi and Kimihei Nakajima learned to fly in a Curtiss biplane at Hammondsport, N.Y. Lieut. Aibat lost his life while flying a balloon in Germany in 1912. Lieuts. Tareishi, Shigematsu and Ogita were killed in 1913 while flying Farman and Morane Saulnier planes.

In March, 1914, the Naval Air Force of Japan had 20 pilots and 10 hydroplanes: 3 Curtiss, 5 Farman and 2 Deperdussin. In 1912 and again in 1914 a total of about $50,000 was appropriated for naval aviation and in 1916 $350,000 was appropriated for the purchase of equipment and construction of bases, etc. In 1918 $750,000 was appropriated for the construction of improvements, etc., at the Naval Air Bases at Sasebo and Kure. Rear Admiral J. Matsumura was the founder of Japanese Naval Aviation and Captains S. Yamanouchi and S. Harada did much towards its early development.

In 1922 Great Britain entered the picture with an aviation mission headed by Lord Sempill. The British pilots, headed by Lieut. A. Loton, an Avro instructor, carried out extensive training and their conclusion at the time was: "The Japanese as pilots are good. They are steady and reliable and the average is very high. They produce very few star turns and they also have many failures. Their great failing is that they are not quick enough in an emergency."

The German mission, of course, has had, possibly, the most permanent effect on Japanese military aviation and it is believed that German officers are still retained today as consultants, if not operating officers, with both the Japanese Navy and Army Air Forces.

The Japanese have produced an effective airplane in the Mitsubishi OB-O1 Navy Bomber, shown on our cover. The Japanese equivalent of "Heavy Bomber" is "Omoshi Bakudanki," hence the "OB" designation. As is well known, combat airplane designations are based upon the Japanese year in which they appeared. The year is that since the founding of the Japanese Empire so that 1943 is known as 2603. Therefore, the OB-O1 was first put into service in 2601 or 1941.

The Mitsubishi Jukogyo Kabushiki Kaishi is a huge, heavy industry combine, similar to General Motors in this country, Vickers-Armstrong in England, Krupp in Germany and Societa Italiana Caproni in Italy. (Obviously all coun-

(Continued on page 53)

William R. Folmer of Dallas, Texas, built this beautiful Fireball powered by a Bunch Tiger. It won the appearance event at the annual Dallas City Championships

CLUB NEWS

California

The Fresno Gas Model Airplane Club is "still going strong"—contests, meetings, and all attendant activities. Latest contest results are:

Class C

Name	Time Sec.
Tex Marbut	757
George Azezedo	574½
Joe Menezes	519½

Class B

Red James	553
Joe Menezes	520
Ocie Randall	432

Class A

Bill Dunham	346
Ocie Randall	252
Dan Martin	21

Juniors

Jim Dugovic	227
James Watson	197
Ray Farrar	109½

CLUB POINT STANDINGS

Class A

John Marshall	810
Bill Dunham	620
Dan Martin	570
Ocie Randall	340
Joe Menezes	270
Jack Whitling	260
Roy Gruenwald	230
Dutch Van Tassel	90

Class B

Red James	761
Bill Dunham	750
Orval Dierks	700
Ocie Randall	460
Joe Menezes	440
Jim Dugovic	410
Tex Marbut	340
Tommy Jenkins	230
Arle Armstrong	230
Dutch Van Tassel	210

Class C

Red James	800
Paul Nieto, Jr.	790
John Marshall	710
Tex Marbut	660
Dutch Van Tassel	461
Bud Warner	440
Jack Soldani	400
Ted Winter	320
Joe Menezes	180
Ray Farrar	170

Juniors

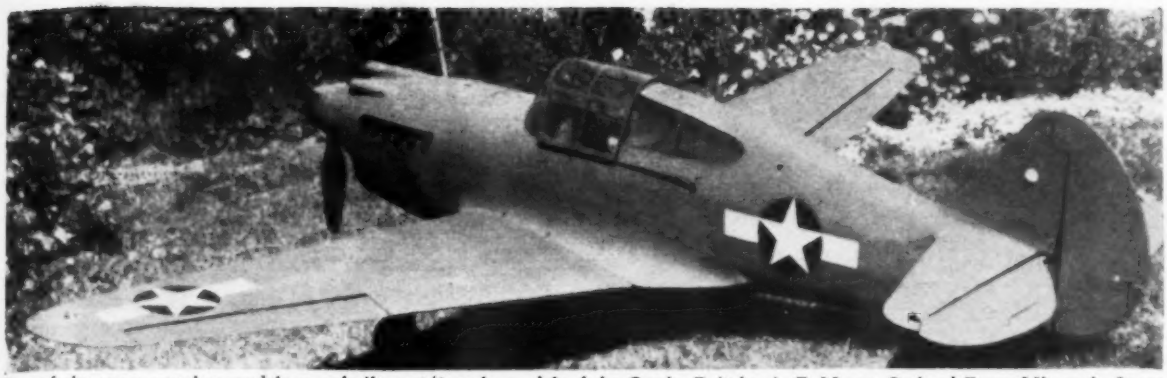
Bud Warner	850
Jim Dugovic	690
Dan Martin	531
Victor Enns	292
Ray Farrar	261
Chas. Burgess	100
Jack Bognar	100
Jack Edmondson	100
Jim Watson	90
Doug Heaslett	71

The Class A standings are pretty well settled as there is no mathematical chance for any contestant to change the position in the final contest. But in Class B there can be some very radical changes, and in Class C a 1st place win could change things for any of the first three leaders.

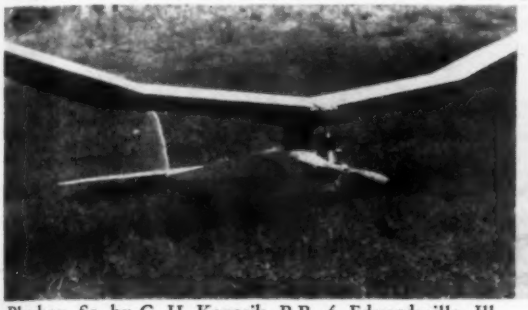
The new officers for the coming year are President, Bud Warner; Vice-President, Paul Nieto, Jr.; Secretary, Ted Winter; Sergeant-at-Arms, Ray Farrar, and Contest Manager, Wm. Dunham, re-elected.

Two new members were sworn in by President James. They were his son, Russell James, and Eugene Thurber.

(Continued on page 58)



One of the most amazing models ever built, a 1/3 scale model of the Curtiss P-40 by A. F. Meyer, Orchard Farm, Missouri. Span: 12-1/2 Feet; Length: 10-1/2 Feet! Two years in building, is complete in every detail. His young daughter sits in the cockpit.

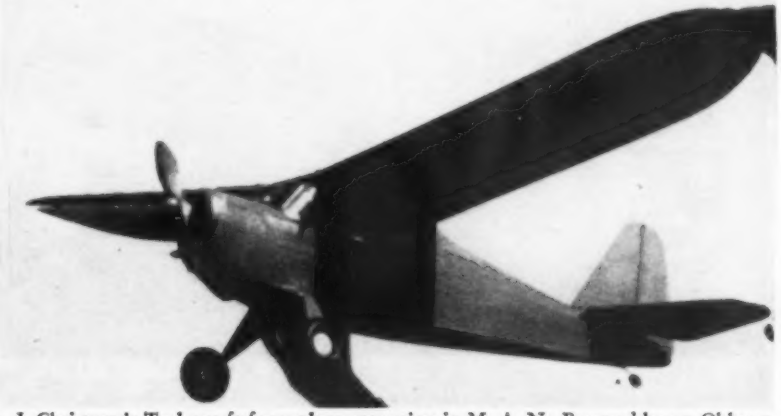


Playboy, Sr. by C. H. Kovarik, R.R. 4, Edwardsville, Ill. Six flights and five repairs, he says, due to lack of balance.

Honey Boy is the fine work of Frank L. Parmenter, 53 S. King St., Hampton, Virginia. A habitual contest winner, on land and water.

Tiny 4-1/2" Spad 13 by Chris Andrews, 931 Hunter St., San Diego, Calif. World War I fan, he plans entire series of finely detailed models of fighters and bombers

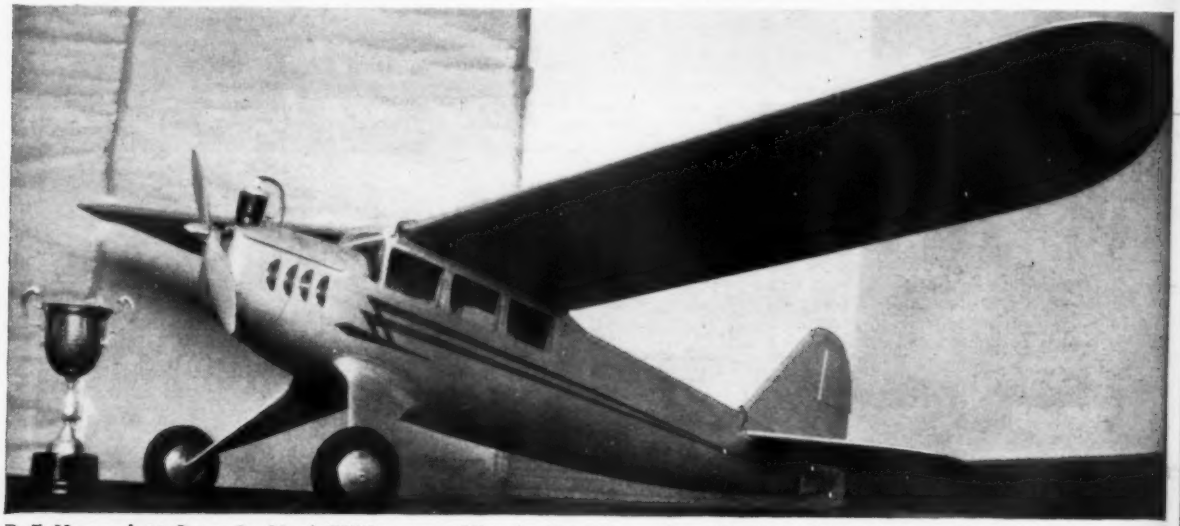
Grumman Fighter control line by Dick Stametz, 815 E. Jackson Blvd, Elkhart.



A. J. Christman's Taylorcraft from plans appearing in M. A. N. Powered by an Ohlsson 23, this fine model has proven "models can look like an airplane AND fly like one."

A cabin biplane with balsa fuselage is the work of J. Boyle Hagerty, Honesdale, Pa. The cantilever wings have a span of 26" and the cabin is complete in detail. Hagerty has been building models for 15 years and "doesn't seem to know when to stop."

The Pacific Coaster is an excellent example of the fine design and construction workmanship of Elbert J. Weathers, pioneer Southern California modeler and contest winner. Now an engineer with North American, Joe still finds time to turn out such beautiful jobs as this



R. F. Harwood, 10 Queen St., North Williamstown, Victoria, Australia, sends us this photo of his 7½' Super Buccaneer, which won the appearance contest cup shown. Mr. Harwood is very interested in corresponding with gas modelers in the U.S. So drop him a line guys

S/Sgt. Albert J. Fleischmann, Jr.'s Curtiss P-40F, powered by a Forster 29, is probably the only model ever lost due to enemy action for this one was destroyed by a Jap bomb. Doing 66½ mph, it was all-balsa, had a 36" wing span, made 20 flights

ADVISORY BOARD

Answers to model design questions by our readers

IT IS a common saying that if you never ask questions you never will learn. Some model builders of course prefer the trial and error method; they like to learn through experience and this is indeed commendable and interesting. However answers to carefully selected questions save many headaches and provide invaluable information on aviation technicalities.

We have a number of letters and questions from model fans who believe in this procedure. One of them is Carlos Escobar of Montezuma School, Los Gatos, California. He asks:

Question: In designing gliders how do you find thrust line and what is the most efficient angle for wings and stabilizer?

Answer: Gliders have no thrust line because they have no thrust, speaking from a purely technical standpoint. Thrust line is the centerline of the propeller shaft along which acts the propeller forward thrust. This pulls the plane forward in power flight, overcoming drag or resistance of the air that tends to hold the plane back. Gliders have no power but receive their forward motion from the pull of gravity. Gravity pulls straight downward and when the plane is nosed down at an angle in a glide gravity provides a forward component force acting parallel to the line of glide. This is the force that drags the glider down-hill, overcoming air resistance of the wings, tail and other parts. This force that drags the glider along the glide path is similar to the force that causes an automobile to roll down-hill. It acts at the center of gravity; so we say the weight of the plane acting at the c.g. pulls the glider forward. Actually this thrusting force passes through the c.g. parallel to the line of flight which under normal flight conditions is parallel to the stabilizer.

Consequently, we consider the stabilizer of a glider as set at 0°. Wing angle of incidence is measured relative to it; usually about 1° in fast hand-launched gliders. Wings of some hand-launched gliders are often set at zero degrees, then if found improperly adjusted after flight testing, the rear stabilizer edge is curved upward to give climb or downward to cause a nosing-over effect.

In slower flying tow-launch gliders greater wing angles of incidence are used —usually about 2° to 3°. This varies with wing camber. Comparatively flat or low cambered wings have small angles of incidence; wings of high camber are at large angles. When upper camber is as much as 1/7 or 1/8 the chord with a correspondingly high lower camber, incidence angles of as much as 5° are used. Many model fans make the mistake of setting high cambered wings at low incidence angles, with inefficient flight resulting.

Question: What type of dihedral is most efficient—gull, "V," elliptical dihedral, etc.? Why?

Answer: This depends upon the objective; all types are used for one reason or another, each having a specific purpose. To understand the answer to this question, it is necessary to know the effect of dihedral: Dihedral corrects lateral instability causing the plane to recover from a sideways roll or displacement. However, few know it is also used for directional stability or control.

If lateral stability is the only consideration it is most convenient and effective to leave 60% of the wing span at the center absolutely straight with no dihedral, providing dihedral by turning up 20% of the wing span at each wing tip. This arrangement approximately provides the greatest stabilizing effect. However, it causes the plane to fly a straight course, resisting normal circling that is advantageous for duration.

Many planes with short wing-tip dihedral are often impossible to turn even with rudder. This type also has another bad effect—it reduces wing efficiency. With only 20% dihedral on each wing tip the tips are turned up at such a large angle that they give little lift during normal flight. Instead they allow air to spill out from under the wing, reducing wing efficiency.

The best type, when lateral stability, turning effect and wing efficiency are considered, is the combination polyhedral wing. This has two sets of dihedrals: 60% of the wing span at the center is dihedral approximately 6° to 8°; that is, each wing half is raised this amount. Dihedral of the remaining 20% of the span at each tip must have an additional 8°; so the center portion of each wing half has 8° and the wing tips a total of 16°. This combination provides excellent stability without greatly reducing efficiency. Turning tendency also is normal.

B. L. R. Sherman has a question concerning propellers. He asks:

Question: What is the advantage of having a single or double-blade folding propeller?

Answer: Folding propellers, whether of one or more blades reduce drag during the glide, after the motor power has been expended. Let us take an example of actual flight with rigid extended propeller blades. It is launched and climbs to a high altitude under power—high enough to give long duration if glide is efficient. At the crest of the climb power is expended and the ship starts to glide. For a flat glide efficiency must be high; that is, drag must be very small compared to lift. Drag of an efficient model will be only about 1/12 to 1/15 the lift. However, when this model glides the propeller blades remain extended and are dragged through the air, causing great turbulence and resistance. This is so large that the model's total drag is as much as 1/6 or 1/8 the lift, nearly double the drag without propeller resistance. Therefore glide will be twice as steep and the plane will glide only half as far and half as long.

Because of this ingenious modelers developed the following propeller. With this type blades fold backward snugly against the fuselage nose when power is expended and the glide begins; consequently, during the glide the propeller offers no resistance.

When a double-blade propeller rotates a blade passes any given spot in the circle two times in one revolution. During this time the propeller moves forward, for instance one foot, so a blade passes this reference points at 6" forward intervals.

If a single-blade propeller is used, the blade passes the reference point once in every revolution, at 12" intervals. So we see the rearward impulses of the blade at any point of rotation are twice as close together with the double-blade propeller as with the single. The result is that the two-blade propeller acts upon the backward moving air produced by the preceding blade. This is known as interference.

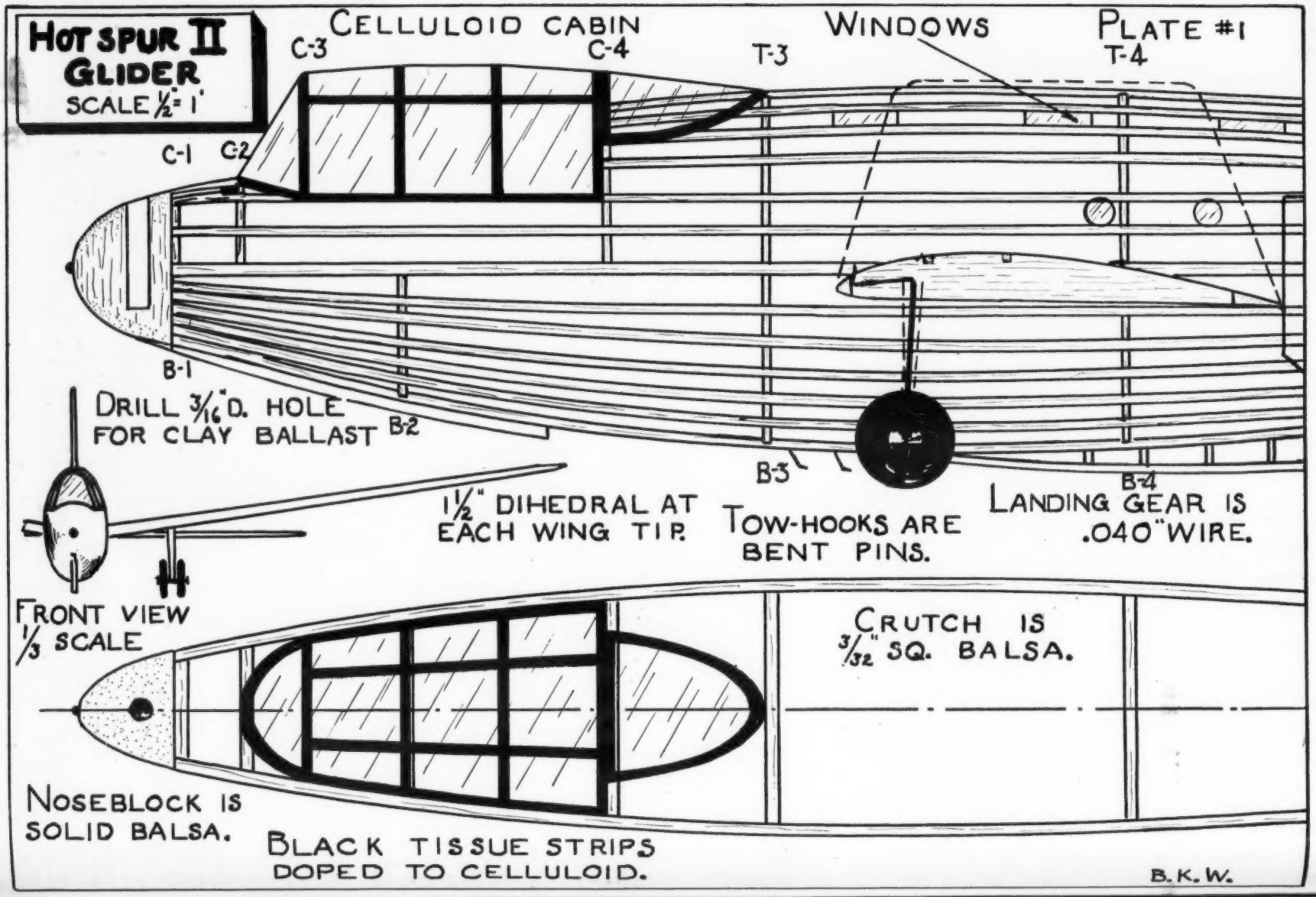
When a single-blade propeller is used intervals are large and the blade acts upon air particles which have been disturbed to a lesser degree. To obtain greatest efficiency from a single-blade propeller the area of its single blade should be 1½ times the area of one blade of the double-blade propeller. This gives a total area of 75% of the double-blade propeller, which reduced area provides the same thrust with less drag because of added efficiency. The drag of a propeller is the force that must be overcome by the motor. Consequently, less power is required for the same thrust delivered.

Donald Walkoe of 2046 No. Kedzie Avenue, Chicago, Ill., is interested in slotted wings.

Question: Should slots be used only near the tips or is it better to slot the whole wing?

Answer: Slots should extend along the full wing span. The habit of using slots at the tips has been taken from large plane practice and not from results obtained in models. Tip slots on large ships are used to prevent tip stall and therefore to prevent spinning. They are not used necessarily to improve general flight efficiency as are slots along the full span.

Martin *Marauder* B-26D with revised tail gun emplacement. Total: eleven .50's


HOT SPUR II GLIDER
SCALE ½" = 1'
CELLULOID CABIN
WINDOWS
PLATE #1
C-1
C-2
C-3
C-4
T-3
T-4
B-1
B-2
B-3
B-4
DRILL 3/16" D. HOLE FOR CLAY BALLAST
1½" DIHEDRAL AT EACH WING TIP.
TOW-HOOKS ARE BENT PINS.
LANDING GEAR IS .040" WIRE.
FRONT VIEW 1/3 SCALE
CRUTCH IS 3/32" SQ. BALSA.
NOSEBLOCK IS SOLID BALSA.
BLACK TISSUE STRIPS DOPED TO CELLULOID.
B.K.W.

HOTSPUR II

by
BRUCE KENT WENNERSTROM

IN PREPARATION for D-day, when the invasion of Germany begins, England is building huge quantities of troop carrying gliders. The plans for a flying scale model of one of these, the Hotspur II, is herewith presented.

The Hotspur is both a troop carrying and a cargo glider, there being two versions. It is a mid-wing design with a span of forty-five feet. Fabric covering is used exclusively. The troops are seated in the main body, with pilot and co-pilot seated in tandem in the enclosed cockpit in the nose.

On the troop carrying version the doors are directly in front of the wing leading edge. The four-wheel landing gear is used for training purposes only, in actual raids landings are made on the skids. For signaling while in flight there is a signal light in the nose.

Unusually clean design permits high towing speeds, yet flat, slow glides. Military gliders must be built like a powered plane, since they are towed at comparatively high speeds and make up in cargo what is lost in engine weight.

Our model has been built to a scale of ½"-1'0"; this is a convenient scale for most flying scale models. The job is best built of balsa; however, if unobtainable substitute hardwood, bass being the best "ersatz" material. But talk won't build your Hotspur, so glue the plans together and let's start.

Fuselage: Because a glider needs no hollow fuselage, as does a rubber job, construction is greatly simplified. In our opinion, the crutch method of construction is just about the easiest way to build a fuselage with a round crossection.

General Aircraft Hotspur II
SPECIFICATIONS

Span	45 ft. 10¾ in.
Length	39 ft. 8¾ in.
Height	10 ft. 10 in.
Wing Area	272 sq. ft.
Aspect Ratio	7.7
Empty Weight	1,661 lbs.
Gross Weight	3,598 lbs.
Wing Loading	14.7 lbs./sq. ft.
Towing Speed	90 m.p.h.
Gliding Speed	80 m.p.h.

The crutch is built directly on the plan top view. Select hard 3/32" square balsa for crutch members. Cut out fuselage formers from 1/16" sheet balsa and cement them in position on the crutch. (Former C-3 is not added until after the stringers are in place.)

Top and bottom center stringers are cemented in place and remaining stringers are added alternately to each side of the fuselage, so as not to distort the frame. Add the nose block and former C-3. If desired, another former may be cemented between C-2 and C-3 so as to form an instrument panel. The section of the bottom stringer between B-3 and B-4 is strengthened by cementing a piece of 1/16" square balsa to this section of the stringer. This must be done since it is this portion of the stringer through which the towhooks are inserted.

The wing must be joined to the fuselage before covering. Since the span is not large, it is unnecessary to have a removable wing. For details of how to assemble the wing, read "Wing Instructions."

It is very easy to reproduce the windows and portholes of the real ship. A strip of celluloid approximately 1/4" wide, x the distance between the first and last

(Continued on page 34)

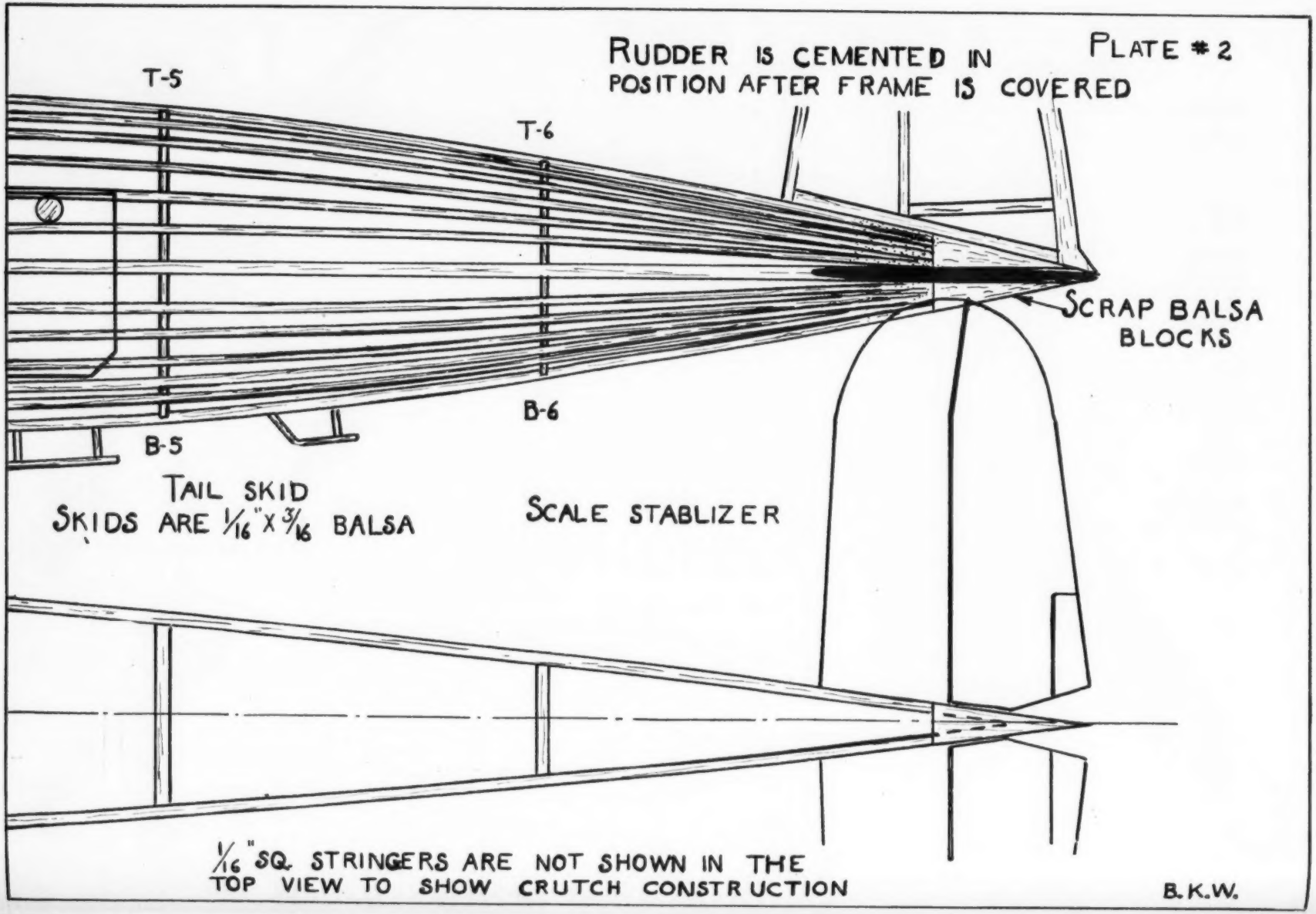
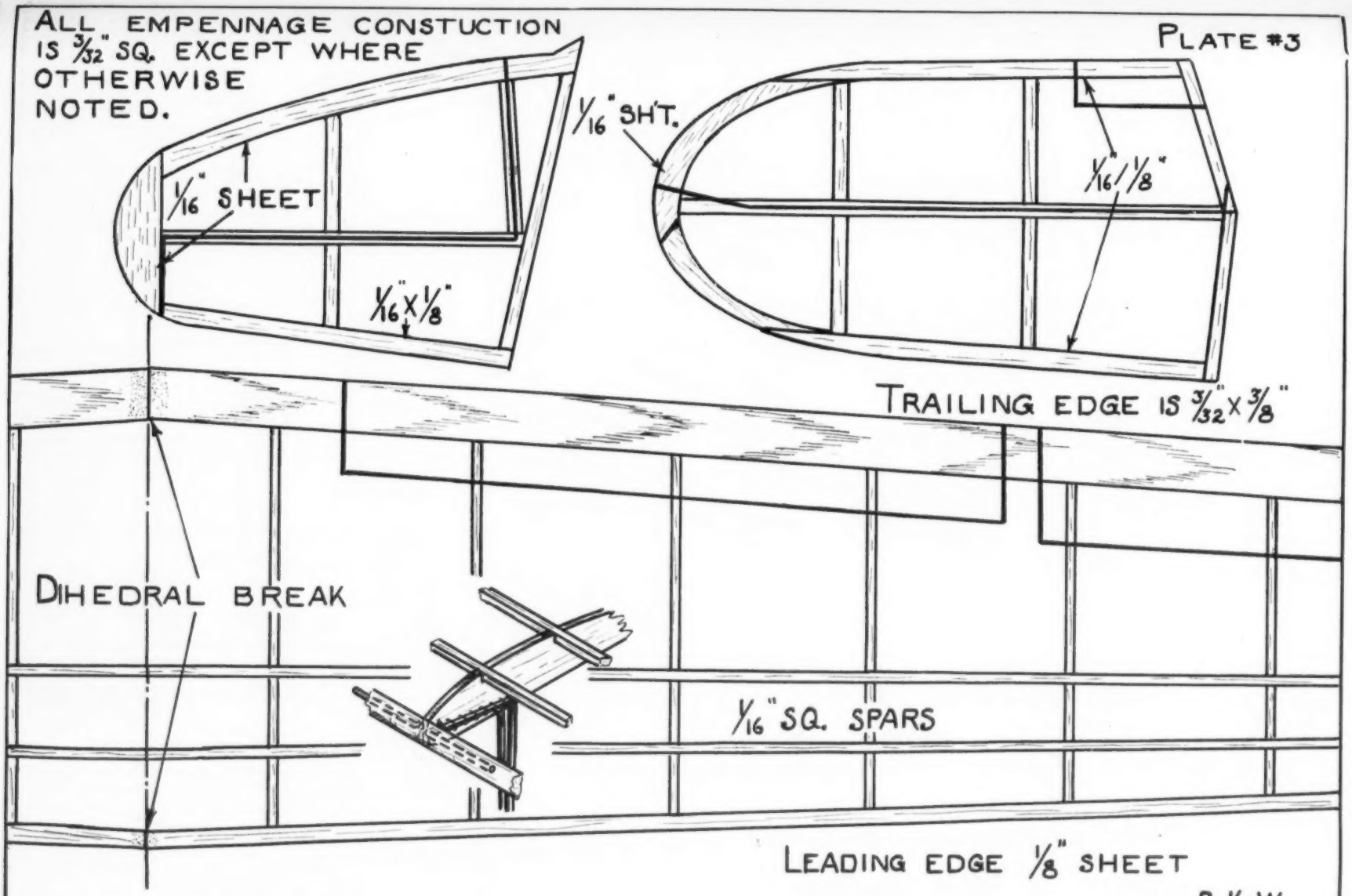
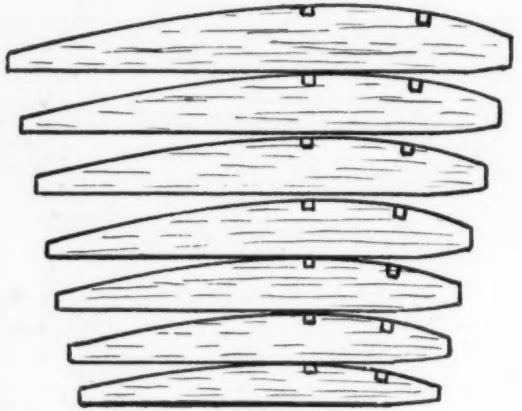


PLATE # 2
RUDDER IS CEMENTED IN POSITION AFTER FRAME IS COVERED
T-5
T-6
B-5
B-6
SCRAP BALSA BLOCKS
TAIL SKID
SKIDS ARE 1/16" X 3/16 BALSA
SCALE STABLIZER
1/16" SQ. STRINGERS ARE NOT SHOWN IN THE TOP VIEW TO SHOW CRUTCH CONSTRUCTION
B.K.W.

PLATE #3


ALL EMPENNAGE CONSTUCTION IS 3/32" SQ. EXCEPT WHERE OTHERWISE NOTED.
1/16" SHEET
1/16"X1/8"
1/16" SH'T.
1/16"/1/8"
TRAILING EDGE IS 3/32"X3/8"
DIHEDRAL BREAK
1/16" SQ. SPARS
LEADING EDGE 1/8" SHEET
B.K.W.

WING RIBS



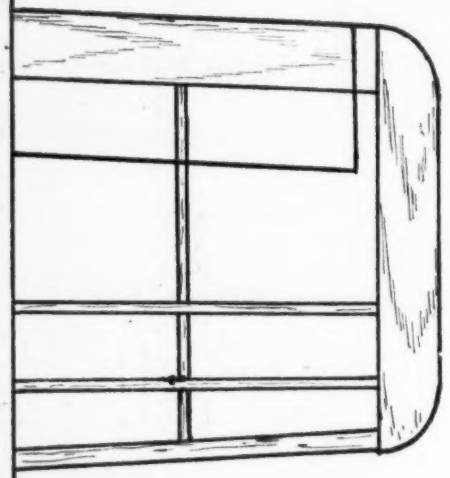
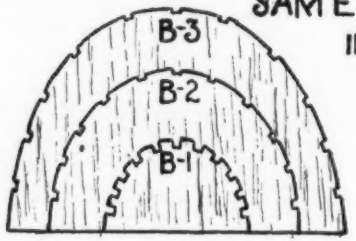
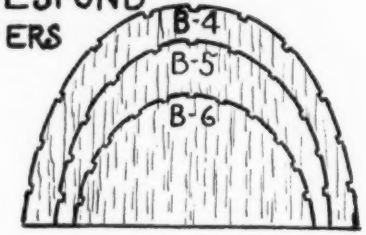
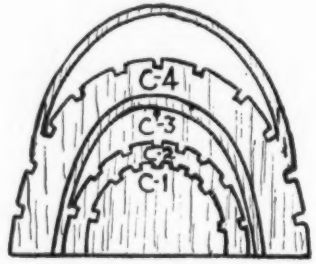


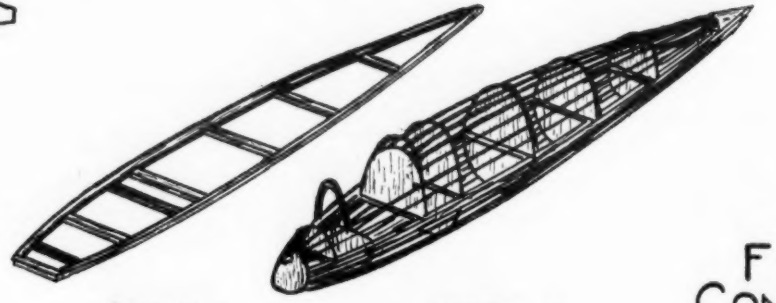
PLATE # 4

ALL T FORMERS ARE SAME AS CORRESPONDING B FORMERS

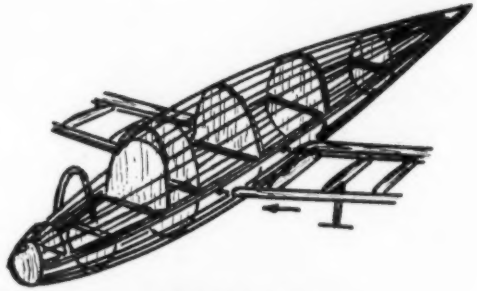








STEP 1 STEP 2



STEP 3

FUSELAGE CONSTRUCTION

1. BUILD CRUTCH DIRECTLY ON PLAN.
2. ADD FORMERS AND 1/16" SQ. STRINGERS.
3. INSERT THE WING HALVES BETWEEN CRUTCH AND STRINGER AND CEMENT L.E. AND T.E. TOGETHER. ADD SPARS. B.K.W.

WORLD WAR I ALBUM

A Collection of Photographs and Technical Data

SPAD 13 C.1

Hispano-Suiza.....220 hp
Span .....26 ft. 10 in.
Length .....20 ft. 8 in.
Height .....7 ft. 6½ in.
Max. Speed.....135 mph

ALBATROSS D-5a

Mercedes .....160 hp
Span .....35 ft. 5 in.
Length .....24 ft. 0 in.
Height .....8 ft. 0 in.
Max. Speed.....160 mph

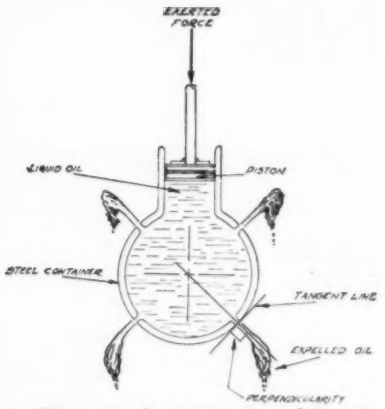
SOPWITH TRIPLANE

Clerget .....130 hp
Span .....26 ft. 6 in.
Length .....18 ft. 10 in.
Height .....10 ft. 6 in.
Max. Speed.....112.5 mph

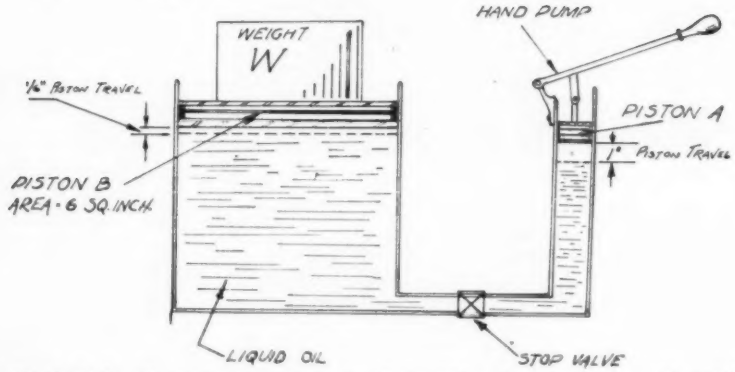
SIMPLE AIRCRAFT HYDRAULICS

A brief resume of a vital aviation science

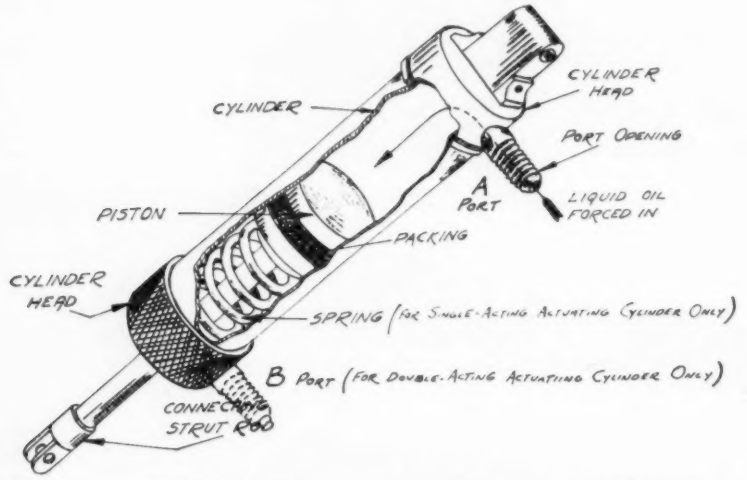
by **STEVE GATSOS**



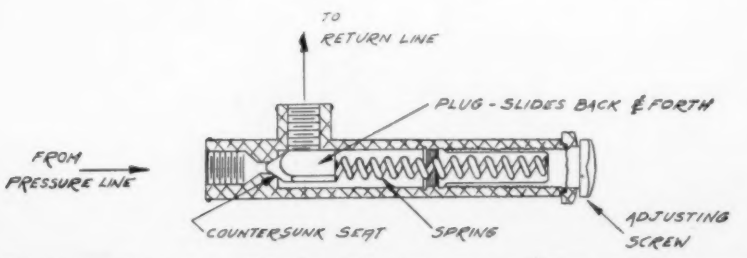
1. Diagrammatic presentation of Pascal's Law



2. Simple hydraulic system shows 1 sq. in. piston lifting 6 sq. in. piston with weight



3. Basic components of hydraulic actuating strut of both and double-acting types



6. Components of pressure relief valve. Adjusting screw determines relieving pressure

THE desire of aeronautical engineers is to develop airplanes possessing higher velocities and greater maneuverability. Their desires are partially fulfilled by designing aircraft with as little resistance as possible. This means that objects like landing gear, tail wheel, arresting hook, bomb bay doors, etc., must be tucked away during flight; it means airplanes of higher velocities require flaps to reduce landing speeds; it means that higher horsepower motors require efficient cooling systems. Furthermore, it means that these parts must be controlled by a simple, reliable and easy-to-maintain system.

Some of these systems are electrically, pneumatically and hydraulically operated. Invariably all planes are equipped with some form of hydraulic system and it is desired here to present and discuss the working of a simple hydraulic system, and its control of landing gear motions.

The Basic Principles: To further acquaint ourselves with this type of system, it is necessary we understand and fully absorb two old principles of hydraulics: One is Pascal's Law and the other the Theory of Incompressibility.

Pascal's Law states that if an enclosed fluid is subjected to an external force this force will be equally transmitted throughout the liquid and perpendicular to the surface of the container at every point. Let us simplify this law: Fig. 1 shows a fluid enclosed in a container. This container is full of holes and we assume for the moment liquid cannot flow through the holes and that the system is in static equilibrium. If the piston is pushed down, thus creating a force on the liquid surface, this force will then expel an equal amount of liquid through all the holes and each stream of liquid flowing out will be perpendicular to the tangent line drawn at any one of the holes. The equal amount of liquid expelled from the container proves the exerted force on the piston is equally distributed.

The second principle, the theory of incompressibility, states all liquids are incompressible. *Liquids can be compressed,* but since the amount of compressibility is negligible they are assumed incompressible in order to simplify mathematical calculations.

The Elementary Hydraulic Jack: These two laws of hydraulics were successfully applied long before our time by such a man as Leonardo da Vinci. One mechanism, well known to all, where hydraulic principles are employed is the hydraulic jack or press which is used for lifting automobiles or forging steel. Fig. 2 shows

if a force is applied on the liquid by actuating the hand pump, this force will exert itself on piston B because it is transmitted throughout the liquid equally, and thus will lift the weight W. Since the oil is confined in the chamber and cannot escape, the amount or volume of oil displaced due to piston A's travel is taken up by the travel of piston B. But the area of piston B is six times that of piston A. Consequently, piston B will move one-sixth as much as piston A in one stroke, or piston A must be actuated six times for piston B to move one inch.

A simple aircraft hydraulic system is not much different from that described above since the same principles are in play and affect the same results. It is a matter of forcing a liquid, oil in this case, under pressure, against a piston of an actuating cylinder to move a certain part, say the landing gear.

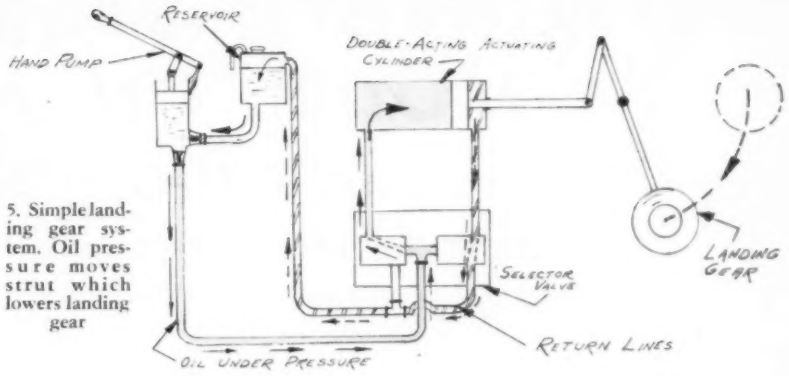
However, before proceeding a discussion of the functions of some important component parts of an hydraulic system, which enable us to apply successfully these two laws of hydraulics, is necessary. These necessary principal component parts are:

1. Actuating cylinders; 2. Selector valve; 3. Hand pump; 4. Reservoir.

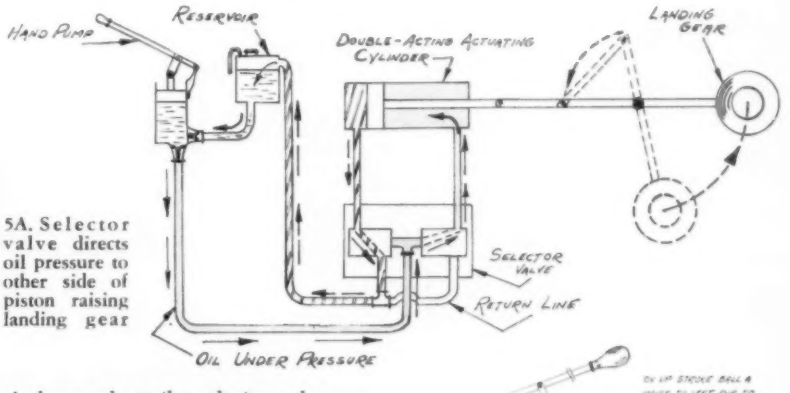
The Actuating Cylinder: Since a liquid possesses a certain solidness when confined and under pressure, this liquid, if forced into the port opening of the actuating cylinder, shown in Fig. 3, will overcome the spring force and move the piston. The distance the piston travels depends upon the amount of oil forced into the cylinder. If, however, this force is relaxed the spring force, naturally, overcomes the pressure and moves the piston back to its original position, at the same time discharging the oil that was under pressure back through the port opening. This type of cylinder is known as a single-acting actuating cylinder and is used when positive motion in one direction is required.

When positive two-way control and partial movement is necessary a double-acting actuating cylinder is employed. Its basic design and construction is similar to the single-acting one, except a spring is used for a single-acting actuating cylinder only, and two port openings for a double-acting actuating cylinder. (See Fig. 3.) Oil is forced through port A which pushes the piston toward the left side. If this force is relaxed the piston will not return to its original position as in the single-acting actuating cylinder due to spring action. To move the piston back, the pressure on the right side must now be relaxed and oil must be forced in through port B. This will move the piston to its original position at the same time discharge oil through port A. Therefore, to obtain a left to right movement pressure must be relaxed on one side and oil forced in on the other; to reverse the motion pressure is relaxed on the pressure side and oil forced in on the other side. Piston travel in this case is limited by the cylinder head while in the single-acting actuating cylinder it is limited by the piston stop.

The Selector Valve: The mechanism that enables the pilot to direct oil first in on one side then the other of an actuating cylinder is the selector valve, one of the very important parts of the system. The selector valve is an aluminum box about 5" x 6" x 4" with many port openings. In our case the valve functions as a single unit controlling only the landing gear and can be adjusted for retracting or lowering it. However, in



5. Simple landing gear system. Oil pressure moves strut which lowers landing gear



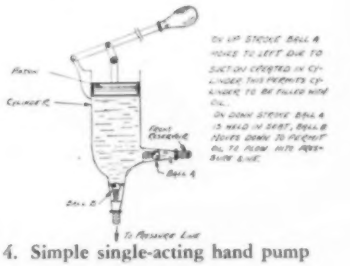
5A. Selector valve directs oil pressure to other side of piston raising landing gear

airplanes where the selector valve controls three or four parts it is not necessary to adjust for each part separately. The valve does not have to be adjusted to "landing gear down" then "wing flaps down"—the pilot simultaneously pushes the landing gear control rod "down" position and a wing flaps control rod to "down" position; then the oil within the selector valve automatically enters the correct channels and thence to the actuating cylinders.

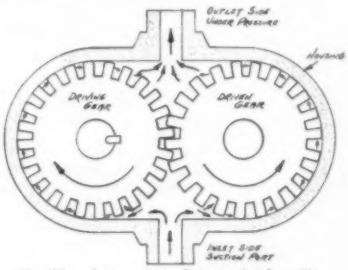
The Hand Pump: Instrumental to forcing of oil against the actuating cylinder piston is the single-acting hand pump shown in Fig. 4. With a supply of oil in the reservoir, the hand pump provides for a continuous delivery of liquid. When the handle is moved up one ball is held in check while the other is unseated to admit liquid in the chamber. On the down stroke the reverse happens to the balls and oil is forced out to the pressure lines.

The Reservoir: The supply of oil for the system is kept in a cylindrical alum-

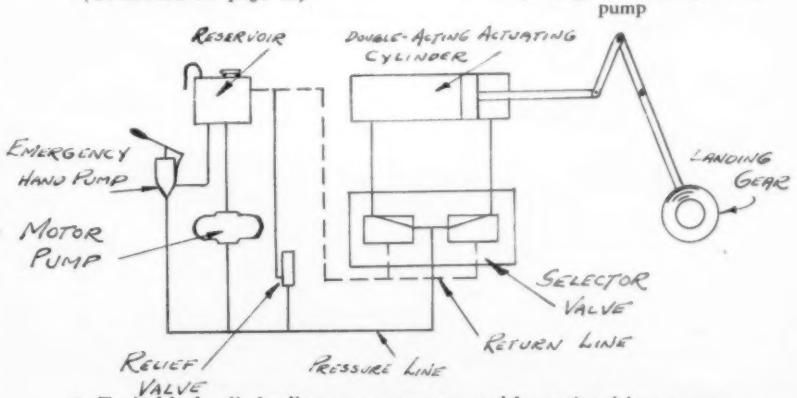
(Continued on page 46)



4. Simple single-acting hand pump



7. Simple engine driven hydraulic pump



8. Typical hydraulic landing gear system actuated by engine driven pump

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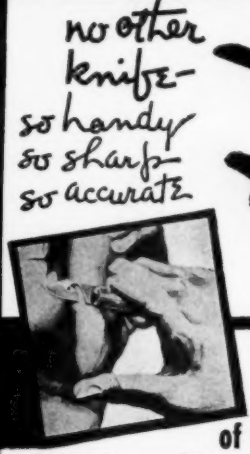

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Hotspur II

(Continued from page 25)

window (or porthole) plus 1/4", is cemented between the two stringers bordering the row of windows. Then cut pieces of Scotch tape the size of the opening (windows are 1/4 x 1/2", portholes are 1/4" in diameter) and press firmly in place, wherever there is supposed to be a window. Then, after the model has been color-doped, the Scotch tape is removed and you have a perfect window. Be careful to avoid cement smears on the celluloid.

Tow hooks, cabin, empennage and landing skids are added after covering.

Wing: One half of the wing is shown full size on the plans. Make a tracing of this half and then grease the paper so that the lines show through and you have the plan for the right wing half. Protect the plans by tacking wax paper over them so that glued joints don't stick to the plan.

All ribs are shown full size on Plate No. 4. Make two of each from 1/16" sheet balsa. There is no center rib. Wing tips are made from trailing edge stock. Leading edge is cut from 1/8" sheet; it is 3/16" wide at the center of the wing, tapering down to 1/8" at each tip.

Build half the wing at a time. The trailing edge is 3/32" x 3/8" pre-cut stock; that is, it has already been cut to a triangular crossection. If you can't get this pre-cut stock you have to cut your own from a piece of 3/32" x 3/8" flat. Cement ribs and tip in place. Stringers, or spars, are not added until after the wing is cemented to the fuselage.

When both halves are finished put some cement on the end (along the centerline) of the leading and trailing edges of each wing half, and insert the ends of each wing into the fuselage, joining them so that the wing is whole.

The leading edge is cemented to the crutch underside and the trailing edge to the first stringer under the crutch (see side view of fuselage). This automatically gives the correct angle of incidence. Dihedral is put in at this time.

Make a jig of books for this job; put two volumes under each wing root, so the fuselage is not touching the table. Then add books underneath each wing tip until each tip is 1-1/2" above the root. Let the cement dry thoroughly.

Now add the 1/16" square spars. The spars run unbroken from tip to tip. Insert the spars above the crutch and then cement them to the top of the crutch and into the wing notches.

The landing gear is unusual inasmuch as it is four wheeled; .040 music wire is used to make the wheel struts. Each strut is really two wire struts covered with balsa blocks (see perspective drawing on wing plan, Plate No. 3). Wire struts are shown full size on Plate No. 1. Bend the wire to shape; be careful to make each half exactly alike. When finished cement the wire struts to rib No. 2 and sew to rib with thread.

Bind the landing struts together with thread and cement scrap balsa blocks to the front and back of the wires. Sand to a round crossection; this gives the appearance of a single strut.

Empennage: The main framework of both rudder and stabilizer is 3/32" square balsa. Tips are 1/16" sheet balsa, as is the rudder trailing edge. Sand both the rudder and stabilizer to a streamline crossection.

Both the scale and flying stabilizers are shown on the plan. If you intend your model to be a display job use the scale size stabilizer. The flying stabilizer is larger; the area is approximately 1/3 the wing area, and is used if your model is to be a flying model.

The rudder is scale size, as is everything else.

(Turn to page 36)

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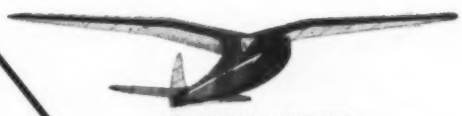

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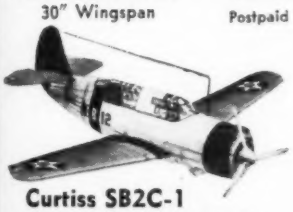

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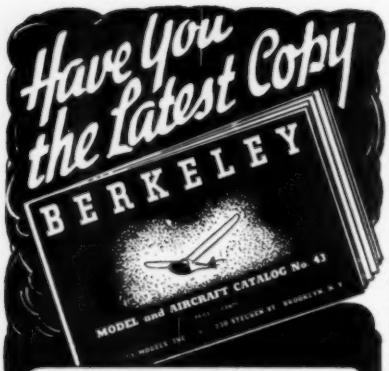

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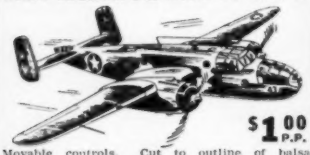

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(Continued from page 34)

Covering and Decorating: The entire model is covered with 0-0 Silkspan, applied wet. When covering the fuselage, use strips running the fuselage length, and covering about 1/4 of the perimeter. Patches of Scotch tape are applied to the celluloid strips before beginning covering to protect it from cement smears, colored dope, etc. Don't try to pull the Silkspan tight, just get all the wrinkles out.

To cover the wing four pieces of tissue about 4" x 12" are needed. When covering the top wing, dope the tissue to rib No. 1; then, pulling gently, dope the tissue to the middle of rib No. 7. Then dope tissue to rest of rib and leading and trailing edges. The bottom of the wing is covered in the same way except that you start with rib No. 2 instead of No. 1. In this way, the tissue, not being doped to all the ribs, can pull tight as it dries.

Tail and rudder are covered similarly. The wheels are now soldered to the landing struts. Wet the entire model with a sprayer so there is no danger of catching fire. Use plenty of washers between the strut and wheels so the wheels won't rub. Clean the end of the axles and solder a retaining washer on each axle.

Prevent the wing from warping by doping one half at a time. Then put it on a flat board, weighting down leading and trailing edges with lead, or books, etc., until the dope has dried. Two coats of clear dope are enough if the model is to be color-doped, as was the original.

The model is sky-blue underneath, and sand brown and spinach green on top. There are two black stripes underneath each wing half.

Color-doping is best done with a spray gun; a small insecticide sprayer works very well. With masking tape and newspapers mask off the areas to be sprayed. The sky-blue goes on first, followed by the brown, green and then black stripes.

The celluloid cabin is made next. In order to obtain proper curvature to the top of the cabin, it is made of five different pieces of celluloid. Black tissue strips 1/16" wide are doped to the cabin to form the framework.

Control outlines and doors are drawn on with black dope and a draftsman's ruling pen. Drawing ink will not take to a smoothly doped surface. Identification letter on the nose is sky-blue. Add decal insignia, remove the Scotch masking tape from the windows and portholes and your Hotspur is finished.

Flying: Test glide the model over tall grass. The wing should have some incidence, as shown on the plans; the tail none. The model should balance at about the midpoint of the wing tips. Tail-heaviness can be corrected by adding clay or solder to the nose. Once long, steady glides are obtained, warp the rudder to the left or add a tab.

Start with the first towhook and gradually work back until the ship climbs steeply without stalling. On windy days the towhooks near the front should be used; on calm days the rearward towhooks are used. Four towhooks are shown on the plan, although some are blocked out by the wheels. The last towhook should be about 1/4" ahead of the C.G. For a towline, use No. 8 white cotton thread. The towline should be about 100' long and have a piece of rag tied near the hook so the drag will pull off the line when you stop running. Do not pull the line off, for this will stall the ship and it will lose altitude in recovering. Always tow the ship directly into the wind.

With a 100' towline, flights will average about 50 seconds. Of course, if the model isn't color-doped times will be a lot higher, but appearance is sacrificed. Good luck!

Bill of Materials

All lengths are 36"
12—1/16" square balsa stringers
1—sheet 1/16" sheet balsa
1—piece 3/32" x 3/8" trailing edge stock
3—pieces 3/32" square balsa
1—piece .040 piano wire
1—sheet 1/8" sheet balsa, or
1—piece 3/16" x 1/8" balsa
4—3/4" diameter wheels
1—piece 1/16" x 3/16" balsa
2—sheets silkspan
1—2 oz. bottle clear dope
1—1 oz. bottle sky-blue dope
1—1 oz. bottle sand brown dope
1—1 oz. bottle spinach green dope
1—1/2 oz. bottle black dope
1—4 oz. bottle thinner
1—small sheet black tissue (2" x 3")
1—small sheet celluloid (5" x 7")
1—small insecticide sprayer
1—roll Scotch masking tape (15')
1—spool No. 8 cotton thread

VICTORY

Fashions for Sky Warriors

(Continued from page 7)

men so they could live and fight in the sub-zero temperatures.

One day in 1920 they bundled Major "Shorty" Schroeder up in a teddy-bear suit, stuffed him into the open cockpit of a French LePere biplane powered by an American-built Packard engine and sent him off into unknown heights. At 38,000 ft., when the little ship trembled and shook and wouldn't climb another inch, his eyeballs froze, his hands numbed on the stick and his senses blanked out as the plane spun dizzily earthward for six miles, before he managed to pull it out and landed safely.

Then, the following year a young daring Lieutenant, John A. Macready, in a cumbersome leather flying suit which had in its lining small electric wires designed to keep him warm in addition to the suit's heavy wool lining, went even higher. He had taped to his face a new oxygen mask. He worked with electrically heated gloves—big, heavy, bulky gauntlets—which helped him to hang onto the ship's controls up where it bounced about in the air like a feather. The goggles he wore were smeared up with gelatin so they wouldn't cloud up with frost and spoil his vision. He pushed the plane up to 40,800 ft. and for five minutes it hung there pitching and swaying in the icy air while he jotted down notes so men on the ground would know what was wrong and could do something about it.

This was the beginning. Other men went higher and stayed up longer. But from each flight a lesson was learned, resulting in an evolution in clothing for airmen—new style helmet, differently shaped glove, two-piece sheepskin suits, layer clothes, electrically-heated fliers' togs and many other developments that make high-altitude operations easier on the pilot and his crew.

This war has made the job tougher.

(Turn to page 38)

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95c

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(Continued from page 36)

Our Air Force units are spread all over the world, in the hot changing desert sands and amid Greenland's towering snow-capped peaks, where it's hottest and where it's coldest. Of a necessity, to fight and fight well, they must be outfitted with the warmest clothes possible both on the ground and in the planes. That is the big task facing the men of Wright Field's clothing unit.

Primarily these experts, who have been dealing with the problem of aviation clothing for years, will tell you their main trouble has been the airplane itself, not climatical changes of the polar regions or desert zones. It is because the airplane has lifted man out of his natural element into a sphere of cold heretofore unknown to mankind. Up where planes fly today temperatures remain about the same, over the Equator or North Pole; in fact records show it is colder at 40,000 ft. over Colombia, South America than at the same height over northern Greenland.

Too, the flying machine is small and compact. They had to make their heavy garments so a man would fit into a small space. And after that, clothes had to be flexible so man could move about and fight. Previously they piled a lot of clothes on a pilot and he was warm. Now they have to cut down on the weight—so they can carry more bombs and bullets. They had to re-design some of our flying suits from the days of Macready, Shroeder and Gray.

Recently they have sent men into the Arctic regions to live under the cold conditions. Reports these men have brought back dictate the styles of the most up-to-the-minute pilot's wearing apparel. Experts have talked and lived with the Eskimos and studied their clothing minutely. Consultations have been held with men who for years have lived in the Arctic and Antarctic regions—men like Father Hubbard, the Glacier Priest; Sir Hubert Wilkins, famous Arctic flier; Bert Balchen, Admiral Byrd—all of whom, over a period of years have learned from experience and know best what man needs to keep warm and comfortable at extreme low temperatures. And they have innumerable records of pilots who have flown at the high altitudes, daily reports of actual combat fighting in the Aleutians and other cold-weather theaters.

Nor are they unaware of what the enemy is doing. Recently complete uniforms taken from captured German and Japanese pilots have been shipped to Wright Field and are under close scrutiny by the clothing experts. In addition, all flight clothing worn by our Allies have willingly been sent here for observation so there may be an interchange of ideas to help defeat all problems. Too, the Navy works in close cooperation with the Army in the development of high-flying gear. There is no better proof of this than the fact that today both Army and Navy pilots have adopted several standard types of clothing. One example is the famous "Mae West" rubber vest.

The U.S. Air Force clothing specialists work with human models and wax figures to get the proper size and shape of a helmet, glove or pair of boots. They hem and stitch leather, shearling and windbreak fabrics. They rip and tear with mechanical gadgets the materials that go into the aviator's flying suit to find how tough they are. Consequently our airmen get the best leather, toughest fabrics, finest wool and synthetics available.

The results are encouraging. Today there are four general types of flying suits in use by our airmen. 1. The electrically heated lightweight flying suit. 2. Multiple type suit consisting of several layers of garments piled one upon another. 3. Shearling or Alpaca lined two-piece suits. 4. Feather lined, quilted flotation suit.

These are the latest types; each is the outgrowth of a particular problem. For instance, when machine guns began to bristle from our bombers the ball turrets came into being. With them a new problem for clothing designers: the average sized man, clothed in heavy, bulky flying suit couldn't climb into the cramped space inside the glass and metal frame ball. The answer was to give all ball turret gunners a light, flexible flying suit to wear and yet one to keep out the cold of high altitudes where the big planes fight. Too, on long flights pilots and co-pilots who must sit in one position for long hours complained they suffered from extreme cold. More recently, the men who fly our planes in the African area have found themselves in a peculiar position. On the ground temperatures are reasonably moderate yet, when they shoot rocket-like into the sky, thermometers drop sharply to sub-zero. To meet these demanding situations something had to be done and quickly. Engineers turned to the electrically heated suit.

In general terms the electrically heated flying suit is a regulation pilot's combat uniform of light-weight material. A series of little flexible wires inside its lining supply it with artificial heat. The principle is the same as the heated blanket which you use on extremely cold nights. Instead of connecting with a wall socket, the airman plugs into a circuit that gets its current from the main generator unit on a bomber or fighter. Wires are connected with a rheostat which regulates the heat as desired.

The suit is a three-piece costume with jacket, trousers and cover-all. Also included are electrically heated leather gloves and light-weight felt shoes worn with a pair of wool socks. Pilots claim the shoes are the most comfortable they have ever worn.

Under actual tests such as that conducted in the cold room at Wright Field and from reports of combat operations these suits proved they are serviceable in temperatures as low as sixty degrees below. Chief advantage of the electric suit is it retains warmth longer than other earlier types.

This solved only one problem. There were many others. Our hemisphere defense plans, long before that fateful December Seventh, included outlying bases which stretched from ice-capped Greenland to the Caribbean's warm waters.

Where it was coldest and the wind howled the loudest, American fliers and their ground crews have made their new homes; for more than two and a half years they have lived in the sub-zero world where nights are six months long and almost daily the snow whips up a blizzard.

"We need a combination type suit," wrote one pilot from an advanced Arctic base. "Give us something we can wear on the ground in temperatures which hover around zero and at the same time make it an outfit we can use up in the air where it gets minus 50° Fahrenheit."

Air Force "tailors" were momentarily

(Turn to page 40)

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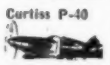

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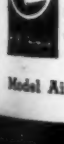

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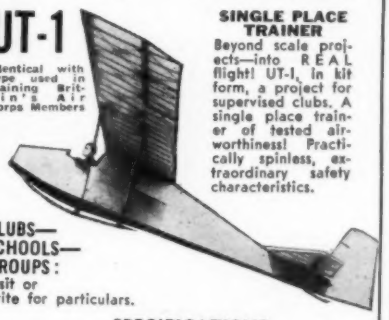

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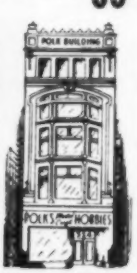

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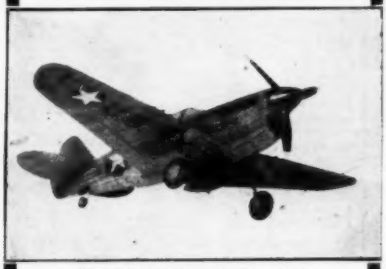

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C-Z MODEL AIRPLANE CO.
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(Continued from page 38)

stumped until they hit upon a simple idea that is proving to be just what Old Man Winter ordered—make two complete uniforms, one to fit over the other when the mercury begins to drop. Around this common-sense principle the Army has created its present-day combination suits. Actually the new uniform is two layers of clothing each of which can be worn separately as full dress.

Under actual cold conditions experiments have revealed this type uniform is warmer than the heavy wool-lined suits which have been standard until recently. Experts point to the fact that the "dead air" between layers of clothes actually serves as an efficient insulator to keep warmth. If you need proof try out the old axiom that several light blankets are warmer than one heavy blanket.

This multiple suit, as it is called, consists of an Alpaca fur-lined jacket whose outer material is a smooth satin finish acclaimed for its wind resistance. (The Alpaca is a small South American animal whose hair is available in large quantities and is being shipped to this country under Lend-Lease.) Some jackets and trousers are lined with wool. Both jacket and trousers have large pockets, a feature long under study and deemed essential. The reasoning is based on the fact that airmen are constantly complaining they have no place to put small articles they are required to carry with them to and from their planes.

Wearing only this inner uniform the pilot is comfortable in temperatures that range from thirty above to forty below. It weighs only a little more than eight or nine pounds and can be worn almost anywhere—in club room or at the base theater. When temperatures run to extreme lows, another uniform is donned over this base suit.

The outer garment consists of jacket and trousers. It is large with plenty of room for air to circulate between the layers of clothes. Made of light, wind resistant cloth the jacket has a large Alpaca fur collar which can be converted into a parka type hood. Trousers held up by large suspenders serve as coveralls and are worn over the suit. An Alpaca fur-lined vest is also worn between the base garment and outer gear when temperatures drop to extreme lows.

Worn with the multiple type suit are rubber-soled canvas boots designed similarly to the mukluk, for years worn by the Eskimo. Experts have learned it is the warmest footwear that can be worn in the Arctic; now it is proving the most efficient for retaining warmth in high altitude cold.

New developments have also been made with the sheep shearling suits that today is worn by most of our Air Forces personnel in the continental United States where temperatures seldom get to extreme sub-zero levels. Briefly the new shearling suit is more flexible and lighter than those formerly in use. It consists of a jacket and trousers, a two-piece affair. Where previously the skin was treated chemically to give it longer wear, the process has been eliminated on the new suits because it has a tendency to crack the leather and make the suits stiff. The U.S. Army Air Forces today is the greatest buyer of sheep shearling.

The new shearling suits will withstand temperatures down to forty or fifty degrees below zero; they stiffen only at extreme low temperatures. Too they are heavy and bulky and sometimes get in the way. Engineers are working on new streamline suits that may remedy this.

Latest development in new suits is the down and chicken feather flotation suit. Although the down feather suits have been in use for years in Alaska, only recently have engineers turned to the chicken feather suit now in production. Because the down suit worked so well in the Arctic regions and was found to be the warmest clothing available in that district, it was decided to combine the buoyancy features and make it a flotation suit. This should prove especially effective for pilots who are forced to make long, over-water flights.

Several tests have been made with the suit. One day Capt. J. R. Schenck of the Equipment Laboratory donned one of the suits and for nearly an hour remained in water without sinking. Finally he had men push him completely under, trying to sink the suit, but it remained afloat. The suit has trousers, jacket and a parka type hood. The material on the outside is heavy windbreak cloth, water repellent. The jacket and trousers are like a piece of quilting, lined with chicken feathers and a cover over it. Although the original suits appeared bulky the new types are designed to eliminate this and give flexibility.

These are the latest full dress wear for present day fighting pilots. To go with these suits are other auxiliary items such as helmets, gloves, and boots, always major problems for men who design the cold-weather pilot's clothing. Many new developments are in progress along these lines and even as this is being written new style helmets, goggles, shoes, boots and gloves are "in the works."

(Turn to page 42)

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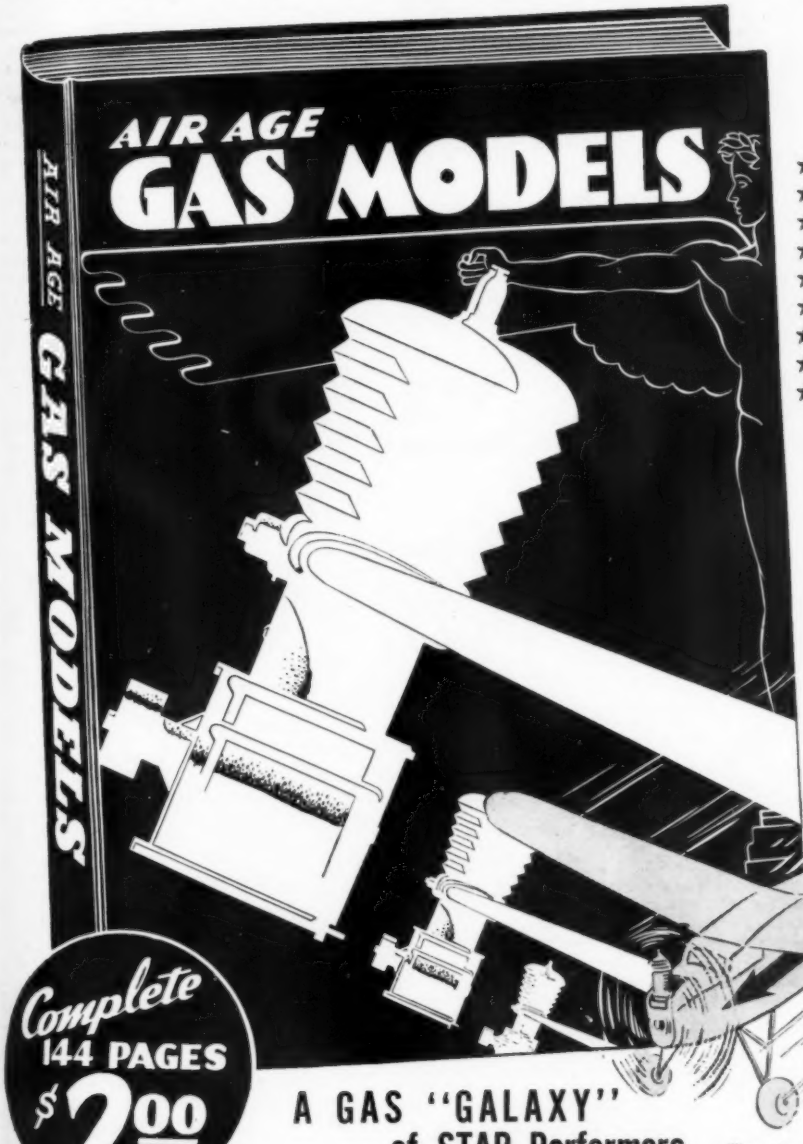

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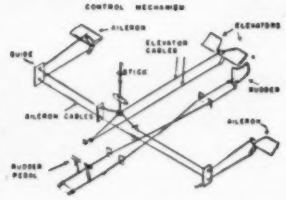

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(Continued from page 40)

The latest pilot's helmet, for instance, is a leather chamois-lined headgear which has earphones and clamps for holding the oxygen mask and microphone. It is so designed that it will take any mask including those used by our allied air forces. Experimental work is also being carried out with new fur caps to be worn by fliers in the Arctic regions. These new designs are based on the coon-skin caps worn by Daniel Boone and other famous American backwoodsmen. Only a few have been ordered and these now are being worn by pilots in combat zones under severe flying conditions. Reports indicate they may at some future date be adopted as part of a pilot's cold-weather equipment.

There are also experimental tests going on with a large bullet-proof combat helmet, a metal affair which looks like the ordinary football helmet. Still very much in the trial stages, the idea is getting considerable attention and may sometime go into practice along with the latest armor-plate vests worn by combat crews in England and other war theaters as protection against flak fragments.

Gloves, too, have been a constant problem. Already in use are the electrically-heated gloves, the lamb-lined one-fingered mitten of horsehide with fur lining and the layer-type combination glove, designed on the same principle as the multiple suit. Two pairs of gloves are worn for warmth.

The latter glove has increased the efficiency of mechanics working on motors and with other metal parts in the Alaskan cold. Many times in the past these men have complained that their skin sticks to the cold metal parts and is painfully pealed off when they try to pull fingers loose. Consequently a light-weight, tight, skin-fitting rayon glove was designed and it has increased their work efficiently

These developments produced for the military airmen have brought about many new innovations in commercial clothing as well. There have been new type belts, zippers, parkas, scarfs, leggings, shoes and other every-day equipment which have added greatly to the working efficiency of commercial products. The men working in the laboratories at Wright Field hold many patents on products that you are buying in the nation's big department stores.

Such is the story of the U.S. Army Air Forces effort to beat the cold of high altitudes. It is a story of clothes and styles that is seldom told, a simple story about new clothes for the fighting airmen who plays an all-important part in helping to win the war.

VICTORY

"The biggest advantage I can see is there's no tunnels!"

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NEW CLASS "C" MAY MOTORS. Send stamp for prices. Will ship C. O. D. Rowley Wooderaft Co., 7337 Wildemere, Detroit (6), Michigan.

EVERY PICTURE AN ENLARGEMENT! 8 sparkling deckle-edge enlargements and roll developed 25c coin; 116 size or smaller; enlarge reprints 3c. Enlarge photo, Box O, Boston, Massachusetts.

BERKELEY, CLEVELAND, MODELCRAFT. H and F Gas kits—Pacer C. $4.95. Pacer B. $4.95. Stratosphere B. $2.95. Comet Rubber Kits. Gas model props 40c, silkspan Gas and rubber types. Dopes, clear, colored and cement 90c pint. Balsa wood and pine. Bright Star batteries. Minimum order $1.00 plus 15% for postage additional. Ship C. O. D. with one-half down. We buy and sell motors. All sizes rubber 5c foot. Holcomb Pharmacy, Alma, Kansas.

WE PAY CASH for new or used model airplane motors or race cars. Hobbycrafts, 1023 Twelfth St., Sacramento, Calif.

MODEL PLANES, BOATS AND PARTS chemistry, all size Balsa wood. Mail orders filled immediately. Montreal's Largest Centre, Hampton Hobby Shop, 6026 Sherbrooke St., W. Montreal, Canada.

CASH: for your used Model Airplane Engine Regardless of Condition. Send description for our top price. A. DeFeo, 55 Dayton Street, Paterson, New Jersey.

REAL PHOTOGRAPHS (not imitations) of all the latest aeroplanes of United States, Britain, Germany, Japan, and other countries. Also World War I. Send 25c for sample photo and 80-page illustrated catalogue listing over 2,000 different aeroplane photographs. Aeroplane Photo Supply, Box 195, Toronto, Canada.

PLANES, BOATS, Hundreds of Hobby Items Catalog 6c. America's Hobby Center, Dept. M 34, 40 E. 21st Street, N. Y., 10, N. Y.

Jet Propulsion Plane Perfected

(Continued from page 2)

ish Ministry of Aircraft Production, the U. S. Army Air Forces and the Materiel Command, was begun to cooperate and coordinate the joint efforts of the interested parties.

Detail specifications and drawings were released to the General Electric Company, Schenectady, New York and six months later the first engine was delivered. In the meantime, Bell Aircraft Corp., Buffalo, N. Y. had been ordered to design and build an aircraft suitable for the installation of two of these new power plants. In twelve months the first machine was ready and on October 1st, 1942, Chief Test Pilot Robert M. Stanley, former national glider champion and record holder, made the first flight of the new type in this country. The following day Brig. Gen. Laurence C. Craigie flew the plane, thereby becoming the first U.S. Army officer to make a flight in such a machine. Successful flights were made subsequently by Brig. Gen. B. W. Chidlaw, Chief, Materiel Division (see p. 10) and Major General William E. Kepner, now commanding general, Fighter Command, 8th Air Force (see cut). Subsequently, "hundreds" of successful flights were made and Lawrence D. Bell, president of Bell Aircraft, says: "I am proud to have been selected to build the first American fighter plane powered by jet propulsion." Bell further compared this new advance to the Wright Brothers' early flights at Kitty Hawk in 1902-3 and believes "this opens a new chapter in American aviation history."

Maj. Gen. Wm. Kepner

The first successful jet-propelled plane was the Caproni-Campini CC-2 which made a flight from Milan to Rome in 1941. The Germans were next reported to have developed a successful design on August 29th, 1941 but no further information has come to press. The Japanese Shozukasi jet-propelled plane was flown two years ago but no further news is available.

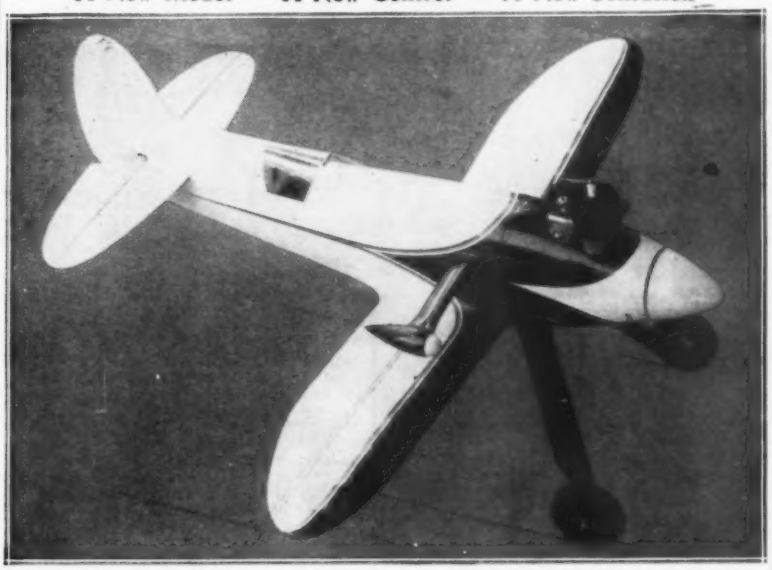
According to the London Daily Mail, the new plane has a top speed of 500 to 600 miles per hour. In appearance it resembles the well known Lockheed Lightning P-38 with twin booms from which the jets protrude from the rear. The

(Turn to page 46)

SUPER "G" LINE FLYING
ENTIRELY NEW & DIFFERENT

IT'S HERE! The SUPER ...V_ SHARK

A New Model — A New Control — A New Sensation

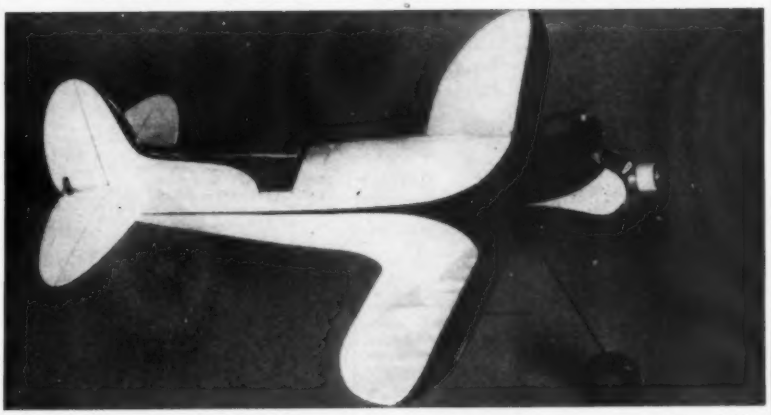


The SUPER . . . V — SHARK, a New Improved Super "G" Line Flying Model, incorporating an entirely new control device, is designed for Class "B" & "C" motors. This beautifully streamlined Shark, having a wing span of 24" roars through space at phenomenal speeds of from 60 to over 120 M.P.H. The model is of special sturdy design and is easy to construct and fly. The New Super . . . V — Shark Construction Kit is a Prize Winner. It contains plenty of fine quality carefully sawn Balsa and Hardwood, Plywood, Printed Parts, Cement, Dope, Covering Paper, Spring Steel Wire, Streamlined Hardwood Wheels, New Semi-Formed Composition Motor Cowling and Prop Spinner, "G" Lines, Directional Control Stick, etc., together with fully detailed plans and instructions.

COMPLETE KIT **4.95**

Postage 30c
100 Ft. Steel Line 50c Extra

BABY SHARK SUPER SPEEDSTER



THE Super Streamlined BABY SHARK, a regular "G" Line model, designed for all Class "A" & "B" motors, rips through space at tremendous speeds of from 50 to 75 M.P.H. It is simple, easy to construct and amazingly stable in flight.

The Baby Shark Construction Kit is most complete, including plenty of good Quality carefully sawn wood, Plywood, Covering Paper, Cement, Dope, Spring Steel Wire, Streamlined Hardwood Wheels, etc., together with detailed plans and instructions.

COMPLETE KIT **1.98**

Illustrated Descriptive Literature 5c

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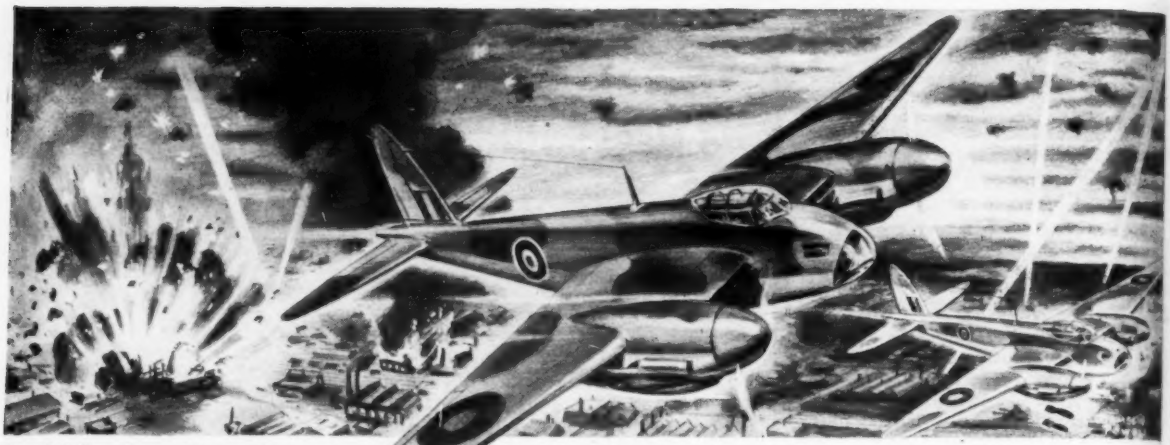
Now "Cleveland Models" Bring You One of



Build the Bomber that's On Every Front Page in America

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These 3-foot models are authentic and extremely realistic for the standard size to which they are designed. Developed primarily for School Training Programs, their popularity was instantaneous — and their low price enables building the entire set at very little expense.

T91-"Mustang"

T77-"Warhawk"

T78-Hurricane

T85-P-38 "Lighthing"

T76-Airacobra

★

Each Kit Only

$1.50

T74-Messerschmitt ME-109

De Havilland "Mosquito"

Considered one of Britain's outstanding aeronautical achievements in World War II, and now in large production both in England and Canada. A high speed bomber of exceptional performance and unusual range, it is an efficient weapon without parallel. Is classified as a fighter-bomber-intruder, and said to be as fast as most fighters. On bombing missions over occupied countries, it is usually accompanied by "Mustangs." Span 40¾". C-D Master Kit SF-145..... **$4.50**

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"Fastest things on wings," says the Army, and it is certainly proving sensational in its combats with Nazi and Japs. A perfect interceptor for bombers because of its high ceiling, and terrific diving power. Giving an amazing account of itself wherever in action. Span 38⅜", C-D Master Kit SF-85 ..... **$4.00**

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Republic P-47 "THUNDERBOLT"

Battleship of the Sky

Giving powerful escort to the big bombers over Europe. Has a 40,000 ft. ceiling, and a diving speed that has hit over 700 m.p.h. Its super armament has earned it the nickname of "Flying Battleship." Span 30¾". C-D Master Kit SF-81..... **$4.00**

Bell P-39 "AIRACOBRA"

Now considered deadliest low-level fighter of the war. Its hard-hitting nose cannon has block-blasted tanks, emplacements, submarines and big planes.

Japs say "It's hell on landing boats." Span 25½". C-D Master Kit SF-76..... **$3.00**

Dive Bomber DeLuxe

Douglas SBD "DAUNTLESS"

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World's hardest hitting dive bomber. Used by U.S. Navy and Marines. Has scored heavily against the Japs in every Pacific engagement. Span 30⅝". C-D Master Kit SF-89..... **$3.50**

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Pride of the RAF. Fast, maneuverable and deadly interceptor-fighter. Span is 27⅝". C-D Master Kit SF-73..... **$3.00**

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An excellent U.S. Navy Shipboard and Marine fighter. Lives up to its name—in the case, for instance, where one of our men downed 5 Jap bombers in 5 minutes. Very maneuverable. Has a speed of 325 m.p.h. Model Span is 26¼". C-D Master Kit SF-83..... **$3.00**

Famous Nazi Dive Bomber

Junkers JU87 "STUKA"

Employed with deadly effect by the Nazis in the Battle of England, and other highly terrorizing Nazi "blitz-kriegs." An "ugly duckling" design, but very efficient. Model Span is 34". C-D Master Kit SF-84..... **$3.50**

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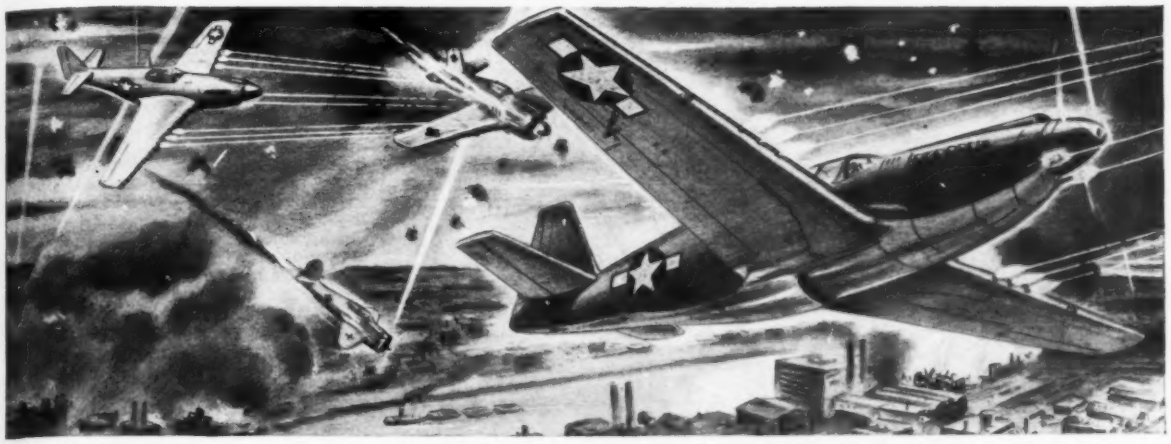


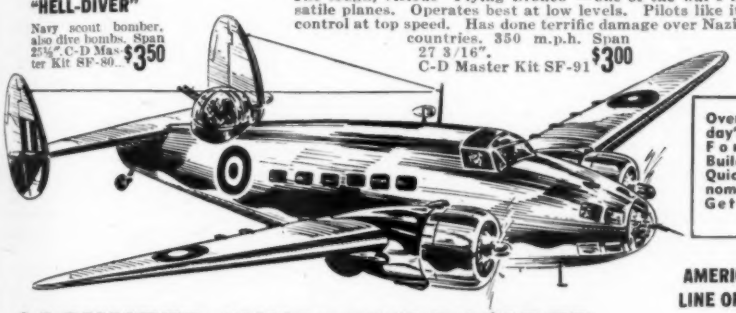
. . And the Fightin' Terror that Runs Interference for it!

North American (P-51) "MUSTANG"

The tough, vicious "Flying Bronco"—one of the war's most versatile planes. Operates best at low levels. Pilots like its ease of control at top speed. Has done terrific damage over Nazi-occupied countries. 350 m.p.h. Span 27 3/16". C-D Master Kit SF-91 **$3.00**

CURTISS "HELL-DIVER"

Navy scout bomber, also dive bombs. Span 25⅝". C-D Master Kit SF-80 **$3.50**



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Brewster "BUFFALO"

Highly maneuverable. Climbs 4,000 ft. per minute. Speeds around 350 m.p.h. Also used by British and Dutch. Former nicknamed it "Peanut Special." Span 26¼", C-D Master Kit SF-87 **$3.00**

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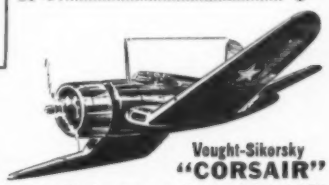

Vought-Sikorsky "CORSAIR"

High altitude, super-speed Navy fighter. Span 30 3/16". C-D Master Kit SF-79 **$3.50**

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If you've never built any models before, start with the simple C-D gliders, or the C-D Industrial Training Models. The Cleveland SF Models are only for the more experienced. C-D Models are built up from strip stock and printed out curved parts, covered with tissue, and doped with authentic camouflage colors. They are minutely detailed, and authentically designed, capable of beautiful flights with rubber power (when rubber is available).

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Balsa Mesquite or Havoc Solids $1.50
Cut-to-shape parts, 2 die cast props in each, turned wheels, insignias, dowels, wire, paint, glue. ALSO: Marauder, Thunderbolt, Spitfire, Mitchell, Lightning, Wildcat. Die cast props for latter 6, 25c each extra.
—Flying Models—

—65c FLYING MODELS—
Lightning, Warhawk, Mustang, Wildcat, Corsair, Spitfire, Devastator. Your choice 65c

$1.25 FLYERS 40" to 50"
Spitfire, Apache, Curtiss P-40. Deluxe, liberally filled kits, masterful photographic plans. Distinguished design. Multi-stringer construction.

RUBBER Power Accessories
Model Pins ½" ..... 50 for 5c
Sheet Celluloid 5x7 ..... 5c
Ball Bear'g Washer, 5/16" or 7/16" 10c
Sandpaper, 2 sheets, 12"x12" 5c
Insignias, Four colors, 36 ass'd Amer., French, English, German, gummed, per sheet 5c
Colored, decal-squadron insignias, 6 pair per sheet, 10 COUNTRIES! 1" dia. ..... 10c 1½" dia. 15c
Prop Shafts, doz. sm. 6c, lge. 10c
Nose Plugs for 3c. ½" 5c, ¾" 4c, 1" 3c

BALSA
OR BASS
Selected Hard Stock
18" Strips
1/16 sq. 15, 5c
1/16x⅛ 10 for 5c
1/16 x 3/16 8, 5c
1/16x¼ 5 for 5c
3/32 sq. 10, 5c
⅛ sq. 10 for 5c
⅛x3/16" 7 for 5c
⅛x¼ 5 for 5c
3/16 sq. 5 for 5c
¼ sq. 4 for 5c
¼x⅛ 2 for 5c
18" Balsa Sheets
1/64x1½ 5 for 10c
1/32x1½ 6 for 10c
1/16x1½ 5 for 10c
3/32x1½ 4 for 10c
⅛x1¼ 3 for 10c
3/16x1½ 3 for 12c
¼x1½ 2 for 13c
¼x1½ ea. 9c
6" & 36" cost 3 times 18": 3 x 36 cost 6 times.

5 FOOT BALSA (Minimum $1)
⅛x⅛ 6 25c
⅛x3/16 .....5 25c
¼x¼ 4 25c
3/16 sq. 4 25c
⅛ sq. 3 25c
¼x½ 2 25c
⅜ sq. .....ea. 15c
½ sq. .....ea. 20c
5" sheets, 2" wide, cost 6 times 18".
18" Balsa Planks
⅛x½ ....2 for 10c
1x1 .....12c
1x2 .....20c
1¼x2 .....30c
1½x3 .....50c
1½x6 .....95c
3x6 .....1.85

Balsa NOSE BLOCKS
1x2x1 .....1c
2x2x1 .....2c
2x2 1½x1 .....3c
3x3x1 .....4c
3x3x2 .....8c
3x3x3 .....10c
5x5x2 .....17c

GAS MODEL ACCESSORIES
Champion Spark Plugs ⅜ or ¼ 50c
Solderless Plugs or Tip jacks.....15c
2 plugs and field jack. ....Special 35c
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Condensers, best qual. 20c; Metal 35c
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Spaghetti Tubing 1/16" 3 ft.—10c
Toggle Switch 35c. Lightweight 35c
SAE 70 oil—½ pt. 35c. Pint.....50c
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Best Quality H.T. leadwire, 3 ft...10c
Booster Leads, special, pair.....50c
Solid DURAL Spinner, Small, Lge.25c
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Jiffy Switches, stops power dives 39c
Neoprene tubing per foot.....20c
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Hillcrest 1.25

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No. 1—7 plans ¼" scale solids: Typhoon, Corsair, Spitfire, Focke-Wulf, Lightning, Curtiss P-40F & Mosquito. No. 2 (New)—Helicat, Zero, Stormovik, Thunderbolt, Mustang, Aircobra, Avenger. No. 5 (Bombers)—Boeing, Liberator, Mitchell, Marauder, Lancaster. No. 10—5 1" scale control-line flyers: Typhoon, Corsair, Spitfire, Focke-Wulf & Mustang. ANY PAK. ONLY

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ALL BALSA CLIMBS 1000 FT. A MINUTE.
Flies One Mile!
Many finished parts in kit. Material for 4 'chutes and automatic release. A real contest-flying model, conforms to N. A. A. specifications! Full size plans, detailed instructions. $1.95

CEMENT
CLEAR DOPE THINNER OR BANANA OIL
1 oz. 8c, 2 oz. 15c
½ pt. 40c, pt. 65c
COLORED DOPE
1 oz. 9c, 2oz. 15c
½ pt. 50c, pt. 75c
MICROFILM RUBBER LUBE or WOOD FILLER LIQ. CELLULOID
1 oz. 9c 2 oz. 15c
½ pt. 50c. pt. 75c

RUBBER BANDS
⅛x8 .....2c
1/16x8 .....1c
Sheet Alum. ½ ft. .003-.005 ....25c .010 .....35c
1/16...6x6 .....35c
Alum. Dural Angle ¾x¾ per ft. 30c
Aluminum Tubing ½" .....per ft. 15c
CAMEL'S HAIR BRUSHES
Med. 8c, Lge. 10c
Gas Model 25c
MUSIC WIRE
.014 ..... 3 ft. 2c
.020 .028 3 ft. 3c
.034 .040 3 ft. 4c
.049 ..... 3 ft. 5c
1/16" ....3 ft. 7c
3/32" ....3 ft. 15c
"U" CONTROL WIRE on spools!
100' 65c; 50' 40c
Wing-Tail Light (Set of 3) 5/16 8c
9/1610c, 11/1612c
Celluloid Radial Motors 1½" 10c; 2"15c; 2½"20c; 3" 25c.
Thrust bearing, ½ doz., Sm. 8c Med. Lge. 12c

STREAMLINE
Sponge Rubber Wheels (per pair)
2" 40c 2½" 50c; 3½" 60c.

BALSA PROP BLOCKS
⅛x ⅜x 5 4—5c
⅛x ¾x 6 3—5c
⅜x1 x 8 3—5c
⅜x1¼x10 3c ea.
⅜x1¼x12 4c ea.
1 x1½x12 6c ea.
1 x1½x15 9c ea.

PROPELLERS

Paulo Wins	Ritz Gas
5" 10c	Mod.
6" 10c	8" 40c
7" 15c	9" 40c
8" X	10" 40c
9" 21c	11" 40c
10" 25c	12" 40c
12" X	13" 40c
14" X	14" 50c
15" X	16" 50c
16" X	15" 50c

RITZ-Gumwood 8"9"10"11" 12"13"14" 20c ea.

DIE CAST PROPS

Two Blade	Three Blade
1½"2" 5c	10c
2½" 7c	15c
3" 10c	20c
4" 20c	35c

Spinner Type 1"....5c; 2" 10c
PLASTIC PILOT ¾" Wheel Control 10c
DOWELS 1/16"x12" ..... 6 for 5c
⅛"x18" 3 for 5c
3/16"x18" ea. 4c
¼"x18" ....ea. 5c

MACHINE GUNS
⅝" 5c; 1¼" 10c
1½" Ring Mt. 15c
1⅝" Ring Mt. 20c

PLANES OF ALL NATIONS
by Wm. Winders
482 Pgs. $3.00
215 Photos
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SKYWAY All Metal Knife 10c
At local dealer. Knife, plus 2 extra blades, postpaid 25c

SPRAY GUNS
Small79c:DeLuxe Large Size, 2 Jars $1.25
Brass Bushings
1/16"-⅛" doz. 5c
Gas model 6 for 5c

Ready for Immediate Delivery
M-4 TANK
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PRE-FLIGHT TRAINER
Aviator's Training Cockpit
Including ready-to-assemble, 10" third dimensional SECRET BOMBSIGHT. Complete cockpit course in how to fly, 24 page, illus. book. Sent insured, postpaid; no packing charge, only $1.95

FREE POSTAGE ON U.S.A. ORDERS
SHIPPING INSTRUCTIONS: Add 5c for insurance. Add 10c packing cost on all orders 18" or less. 36" or 5 ft., 20c. Postage FREE in U.S.A. No free postage if outside 48 States. To packing costs also add 15c% postage if outside 48 states.
Minimum order—50c. No C.O.D.

CAMOUFLAGE KITS $1
9 bottles camouflage colors instruction booklet. (By mail $1.30)
Gas Model BAMBOO PAPER—Yellow, blue, white, red.....3 for 25c
SILKSP'N white only: Gas Model 3 for 25c; Rubber Power, sheet....5c
AA TISSUE Ass't'd col., dz. 35c Silver .....ea. 5c Supersilk, wh. 5c

SKYWAY MODEL AIRCRAFT SUPPLY CO. ★ 426 SIXTH AVE., Dept. M ★ BROOKLYN 15, N.Y.

Fly the Kitten

(Continued from page 13)

ly in it. Bend the shaft from .055 or 1/16" wire, not omitting the rubber tubing over the motor hook nor the spring and washers. Glue a length of wire, same size as shaft, to the stub and add solder to counterbalance.

Covering and Assembly: Taper and sand the fuselage stringer, and also the top longeron. Now go over the entire body with fine sandpaper. When satisfied, paper the bottom with wet "00" Silkspan and after it is dry dope both inside and out to preserve structure. Now cover the two top sections back to the rear dowl with wet paper to facilitate the curves. When the paper has dried, dope it three times and finish with a coat of lacquer.

Now sand and cover the stabilizer with tissue, and apply several coats of dope. Cement the stabilizer to the fuselage and add the rudders, keeping them straight and true. When the cement has hardened, carefully fillet the tail to the fuselage. Repeat the covering procedure for wing. The wing centersection of our models were covered with Silkspan.

Flying: Make up a motor of 14 strands of 1/8" rubber, 24 inches long. Lube well with a thick lubricant, and tie one end two ways to form an eye through which the dowl may be slipped. We wouldn't try 1,000 turns if we were you!

Because of the design, "down thrust" is necessary, and a small amount of right thrust is also required. Alter the wing incidence to produce a "gentle as a Kitten" glide, and then the thrust line for a rocket climb in right spirals. We found a little more incidence in the right wing and some left rudder helped.

Don't be afraid of spiral dives, as the Kitten has pulled out even when put into an awkward position by a sudden gust of wind. And a postage stamp field will not suffice for this performer! We know from experience. Good luck!

VICTORY

"Intriguing darned things, aren't they!"

(Continued from page 43)

craft, in flight, has a terrifically loud, hissing sound, and British persons, who have nicknamed it "The Squirt," say it sounds like a giant tea-kettle at full boil. At first, citizens ran hurriedly for air-raid shelters thinking it was a new enemy bomb. It appears on the horizon with a low whistle which grows in intensity as it passes over until it disappears in a few seconds with a horrible roar.

The type is now in production both here and abroad and the first of the type will be used for training purposes, it has been disclosed. Details on the power plant, the airplane, the control method, the performance and the extent of production are, of course, highly confidential and it is a moot question, without these facts, whether or not the next craft will enter the war in time to alter the course of the enemy's defeat. However, its post-war possibilities are quite clear and we may well regard this news as one of the most outstanding developments in aviation history and certainly the first major modification to the principle of flight as laid down by the Wright Brothers in 1903 and unaltered in the ensuing 40 years. *(Complete details of the Whittle jet propulsion system were carried in* MODEL AIRPLANE NEWS, Feb. 1940 *issue.)*

Simple Aircraft Hydraulics

(Continued from page 31)

inum tank which has an approximate capacity of one gallon—size depends on the number of parts to be hydraulically controlled. Special vanes on the inside guide the flow of returning oil in order to avoid gathering of bubbles in the oil lines and actuating cylinders. It is understood why bubbles are detrimental to the successful control by hydraulics: air is easily compressed and if a mixture of oil and bubbles were forced into an actuating cylinder direct reaction would not result since a certain sponginess, contrary to the theory of incompressibility, is evidenced as the hand pump is actuated. Bleeding or draining the entire system is then necessary.

We are now ready to arrange our component parts to form a simple hydraulic system. Inspection of Fig. 5 enables the reader to realize the similarity between the hydraulic jack (Fig. 2) and the above described component parts. Fig. 5 shows an arrangement of the hand pump, reservoir, selector valve, actuating cylinder and connecting lines which control landing gear movements. Let us assume the landing gear is in retracted position and

(Turn to page 48)

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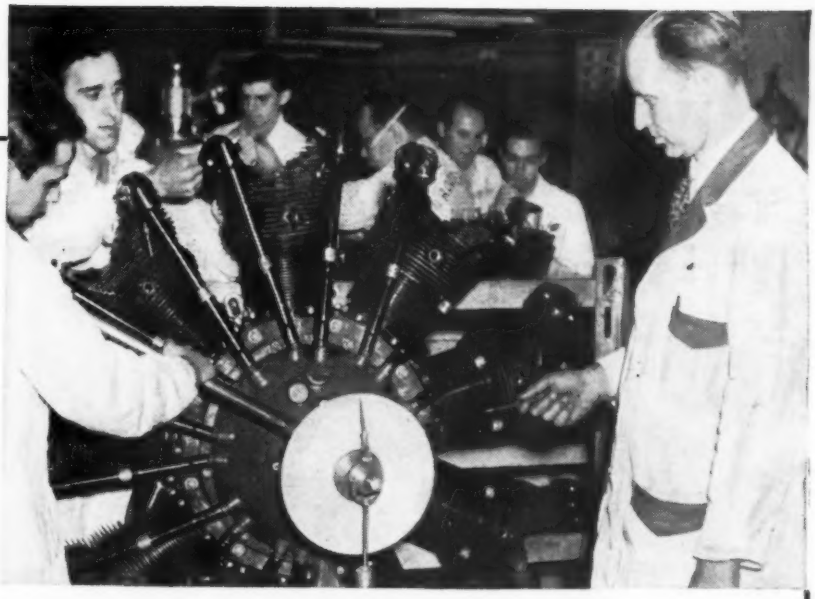

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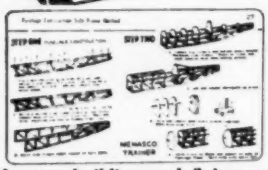

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See page 3

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(Continued from page 46)

we desire to lower it. Upon actuation of the hand pump oil is delivered through the lines to the selector valve (follow the arrows in Fig. 5). The selector valve is adjusted to permit oil to flow into the *left* side of the actuating cylinder which forces the piston to travel toward the *right* side. A strut is connected directly to the landing gear which pivots about a fixed point; thus, as oil is forced against the piston the landing gear is lowered. The speed of lowering the landing gear depends on how quickly oil can be forced into the actuating cylinder. To retract the landing gear, the selector valve is adjusted now to permit oil to flow in the *right* side of the actuating cylinder thus pushing the piston toward the *left* side which in turn retracts the landing gear (Fig. 5A.)

As the piston moves toward the left side the discharged oil flows back through the selector valve and thence to the reservoir, passing through a filter. The landing gear can be locked in any intermediate position by adjusting the selector valve to a neutral position thereby stopping the oil flow either out of or into the actuating cylinder.

Substitution of Motor Driven Pump: In Fig. 4 a hand pump is used to carry the oil through the system; however, a motor driven pump is the standard driving force of all hydraulic systems with a hand pump as a standby for emergency. The use of a motor driven pump necessitates addition of a relief valve; the typical relief valve is shown in Fig. 6. The steel ball is held in the countersunk seat by the spring which is compressed and is adjusted by a screw. When maximum pressure of the system is exceeded oil will push the ball and spring back and will flow through the return line to the reservoir—when this occurs it will relieve the system of excess pressure resulting from thermal expansion.

The motor driven pump itself consists of a pair of gears enclosed in a housing (Fig. 7). Oil is drawn into the inlet by the suction created as the oil is trapped between the closely fitted gear teeth and housing as the gear teeth rotate. The oil is carried around with the teeth and expelled into the pressure lines. Efficiency of this type of pump depends upon the close fit between gears and housing. A motor driven pump can be either electrically motor driven or directly connected to the motor of the airplane; larger pumps are usually connected to the motor.

Fig. 8 shows a motor driven hydraulic system. The flow of oil, adjustment of the selector valve and motions of the landing gear are all similar to those when the hand pump was used, with exception that quicker reaction results because of the greater volume of oil the motor driven pump forces into the system.

It must be understood, however, that what has been presented here is indicative of the title—simple. Many mechanisms, devices or complete setups installed in airplanes have not been discussed since the purpose of the article is to present a few laws of hydraulics and point out one of their many applications.

VICTORY

Design Forum

(Continued from page 11)

effectiveness, thereby rendering stall recovery an impossibility. The stabilizer is absolutely unnecessary and the entire forward surface is made movable. Linkage to the control stick in the cockpit has an especially high ratio so that very large changes in the elevator angle are quickly accomplished. Irrespective of this linkage, however, control forces are inherently high in this design and the pilot is subject to fatigue rather quickly as it is necessary to continually "fly" this canard by an almost physical control. Location of control surfaces forward of the main wing requires extremely large supporting booms as reactions are quite sudden with correspondingly high loads. Dive recovery would be a treacherous job insofar as control load factors are concerned and it is highly doubtful if the pilot's strength could overcome a dive in the region of 4-500 miles per hour. Although the canard has been flown successfully (as recently as 1932 when the German Focke-Wulf F-19a *Ente* or duck proved successful) its application is limited to extremely low speed airplanes (80 mph max. in the *Ente*).

The advantage of two propellers is lost with the use of the (comparatively) low-powered Allison 1,200 hp engine. This means that only about 400 hp is available to each propeller when considerations

(Turn to page 50)

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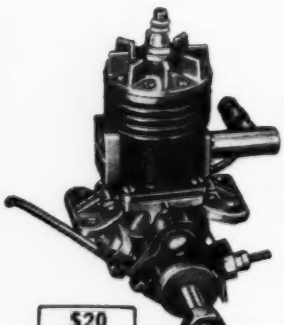

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of propeller efficiency, losses in transmission gearing and shafting, engine cooling and accessory-drive requirements are taken into account.

Several rather admirable features are shown in Mr. Budke's design however. Propellers location and absence of structure aft of them is commendable, as is the armament arrangement.

Design No. 2 comes from Robert Ronay, 243 Howard Avenue, Staten Island, New York, and shows a jet propelled fighter plane with heavy armament. Mr. Ronay has not been particularly elaborate on his propulsion system, leaving details largely to the reader; therefore it is difficult to analyze his design. The general layout is quite satisfactory and location and arrangement of air intake ducts is clever indeed.

Although the present state of the science of jet propulsion does not permit of a great deal of discussion, it is important to bear in mind that the propulsive engine must deliver two things in order to give maximum jet energy: heat and pressure. The broad basic rule of jet propulsion is that air is taken into a container heated and (therefore) expanded and forced through an extremely small opening. This tends to compress the air again which results (because hot air is difficult to compress) in a terrific velocity of air issuing aft from the jet.

Mr. Ronay's design might be considered an intermediate step between the conventional airplane in use today and the jet-propelled airplane which we surely shall have in the very near future. His installation calls for no heating of the air but rather a mechanical compression and expansion of the propeller slipstream. We are highly doubtful that sufficient kinetic energy at the jet could be developed in this manner. Losses in the duct arrangement shown would be considerable, if a constant air temperature be analyzed, and the drag resulting from loss of energy in the stream would be taken, of course, from the energy produced by the propellers. In effect, (Bruner) Mr. Ronay has simply formed a conventional venturi tube within the airplane fuselage. Pressure is increased as the throat less than the mechanical reduction in area. Mr. Ronay's tunnel design shows a reduction in crossectional area of about half; this means an increase in flow energy of only 3/4 x 2 or about 1-1/2 times the thrust of the engine-propeller combination.

George E. Taylor, Jr., of 818 East 9th St., Anniston, Alabama, sends in his design, No. 3, for a multi-place fighter plane. The main point of design is installation of counter-revolving propellers mounted on the tail boom. Gearing details for this mechanism are shown on the drawing. Design of such a structure presents highly complex problems which we are dubious of being overcome. It consists mainly of a cantilever monocoque tube of small diameter carried through the interior of the propeller shafting. The propellers, which would have to be of a particularly costly and complex special design, ride on bearing surfaces attached to this shell. The engine drive is geared to an internal gear on the propellers. The counter-revolving mechanism is not shown on the drawings. For mechanical reasons of design and construction, this mechanism is far too costly and unstable to warrant practical application. From an aerodynamic standpoint, the flow pattern about the region is a complex series of turbulent streamlines whose energy is lost in large respect both before entering the propeller region and after leaving it.

Flash News

(Continued from page 2)

Chrysler Corporation turns out Army Bombers in a plant that could house Willow Run and 20 baseball diamonds with room to spare. Employing 25,000 workers, the giant works is frequently termed, affectionately, "Hitler's Heaven". . . . Curtiss-Wright announces 2500% increase over 1939 in production including forty million pounds of airplanes in 1943. . . . Buick Division of General Motors has powered more than 8,000 *Liberators* (32,000 engines). . . . Republic announces completion of full-year quota of *Thunderbolts* on schedule. . . . Grumman has delivered the last *Avenger* and is now concentrating on the *Hellcat*. . . . Wright has produced 140 million horsepower since Poland.

ONE OF THE great combat generals produced by World War II is General Sir Bernard Law Montgomery who has revealed a new strategy in warfare when he unqualifiedly stated: "First of all, you must win the battle of the air. That must come before you start a single land or sea engagement. I followed that principle from El Alamein through Tunisia, Sicily and Italy. It is the first great principle of modern warfare." . . . With the reorganization of the British-American military command for the invasion came Lt. General Ira C. Eaker's transfer from command of the 8th Air Force in England to command of the aviation forces in the Mediterranean. Upon relinquishing his post to Lt. Gen. Carl Spaatz, he summarized the efforts of the 8th for the year 1943. Results: in 64,000 sorties a total of 55,000 tons of bombs were dropped, 1,400 Nazi fighters were destroyed and all of this at a loss to the 8th of less than 4%. . . . Air Marshal Breadner replaces Air Marshal Edwards as overseas (London) commander of the Royal Canadian Air Force. . . . The Royal Air Force triple their bag of enemy night fighters in 1943 over 1942.

YANK FORTRESS pilots have discovered at least one method of combating the Nazi rocket fighters: weaving rapidly from side to side, thereby slowing down the following rocket-drag-laden Luftwaffe killers leaving them to be knocked off by escorting *Thunderbolts* and *Lightnings*. . . . Greatest toll of our bombers by enemy ack-ack, now highly effective up to 20,000 feet. Losses against enemy fighters as compared to enemy *flak* runs better than 10-to-1 in favor of the latter. . . . The *Thunderbolt* now is ready to make life interesting for the *Boche* on the French beachheads with two thousand-pound bombs, slung one under each wing. . . . British Navy flat-top fliers like the new R.N.A.S. *Corsairs* better than the faster but trickier (for deck operation) *Seafires*. . . . R.A.F. spokesman finally cleared up mystery of why British stick to .30-caliber batteries rather than American-popular .50. Seems that on night fighters, close range work with large number of .30's is vastly more effective than longer range .50's.

GENERAL ARNOLD let loose a flock of facts and figures in his first summary of operations. Among them: there are now 2,385,000 officers and men wearing the gold wings on blue-circle of the A.A.F. on their shoulders. These men have flown a quarter of a million combat sorties against the enemy, shot up 40 million rounds of ammunition, burned up two billion gallons of gasoline, definitely

(Turn to page 52)

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City..... State.....

destroyed 8,478 enemy airplanes, probably knocked out 2,555 more and damaged another 2,834. He also revealed a modified North American *Mitchell* B-25 with eight .50-caliber machine-guns in the nose, the work of Lieut. Colonel Bill Gunn in the South Pacific. . . . Curtiss-Wright's new wind-tunnel and research establishment has a chamber big enough to hold a complete 4-engined transport which can be decompressed to simulate stratospheric flight. . . . The tunnel in Pasadena being constructed jointly by Consolidated, Douglas, Lockheed and North American will have airspeeds the equivalent of 700 miles per hour. . . . World's longest air-freight line, now operating on a regular schedule, is the Army's Wright Field, Dayton, Ohio, to India which covers 28,000 miles (round-trip) and is flown in about 12 days including loading and unloading of cargo at both points. Badly needed, strategic items such as fuel pumps, starts, magnetos, etc., are normally carried. . . . The Senate Military Affairs Committee has approved a recommendation that the Congressional Medal of Honor be awarded to the late General William "Billy" Mitchell, who was court martialed for yelling a little too loudly for a strong air force in the U.S. . . . The Navy has signed a contract for the construction of a "number" of Martin *Mars* JRM-1 giant flying boats for use on the far-stretching Naval Air Transport routes. . . . Six complete radio stations are now in operation along the Northern Atlantic airway route. Erected and operated by the A.A.F. Army Airways Communications System, the stations are located in the U.S., Newfoundland, Labrador, Greenland, Iceland and Great Britain. They are long-wave communication sets which have been found to be more dependable in the bad weather of the route than short-wave sets which are vulnerable to atmospheric conditions and magnetic storms. This long-wave network insures 24-hour communication between planes and stations along the ferrying route. . . . "Never count out a transport 'till it's scrap," seems to be the motto when the subject of "old" American transport planes comes up. There are still about 90 Ford tri-motors in regular operation in South America and a Boeing 80-A tri-motor is still doing its regular stint hauling freight in Alaska. . . . And speaking of transports, Douglas is ready for mass-production of its DC-4 four-engined giant (known as the C-54 in the Army where hundreds are now in use) as soon as hostilities cease. It is believed that transcontinental schedules will be slashed about 1/4 with this 117 ft. behemoth. . . . The Institute of Aeronautical Sciences has awarded the Sylvanus Albert Reed trophy for 1943 to Dr. Sanford A. Moss for his pioneer development of the turbosupercharger over a period of more than 20 years.

THE N.A.C.A. HAS requested an appropriation of $1,161,500 for the design and construction of a laboratory for the specific purpose of testing helicopters. In addition to aerodynamic investigations, the new lab would provide facilities for flutter and vibration analyses. . . . Great discussions are under way concerning the future of Oklahoma City's million dollar airport, one of the nation's finest: It seems oil has been discovered on the property! . . . Where does aeronautical research on a general subject finally wind up? Lockheed research men can provide at least one answer: they have discovered desozyephedronium, a new *sulfa* drug which alleviates colds and prevents ear and sinus infections! . . . Lieut. Rex Mays, who will be remembered as national Indianapolis Speedway winner on several occasions, is now a pilot with the Air Transport Command and has logged more than 600 hours. . . . David R. Davis, of the wing-bearing-his-name fame, has not been idle and his airfoil research program is in full blast. The blast, however, is not that of a high-speed wind tunnel. It is merely his heavy sedan with a large, flat top on which he mounts his airfoils. Driven at a fast clip across California's Mojave Desert, his inexpensive testing machine also developed the first successful Davis wing. And other new airfoils are on the way. . . . The last of the Vought OS2U-3 *Kingfishers* has rolled off the line and production at Vought's Stratford, Conn., plant has been turned over to the famed *Corsair*. . . . Westinghouse has a 3 ft. long wind tunnel capable of producing speeds up to 800 mph. Purpose: the testing of bomb fuses to ascertain that abnormally high speeds do not set them off!

OFFICIAL REPORTS have at last been made public on the splendid record in action being made by Marine Corps Aviation division of the U.S. Marine Corps. In the vanguard of the amphibious attacking forces on Guadalcanal, Bougainville, New Britain, etc., Marine Corps Aviation squadrons have distinguished themselves. Squadron VMF-124 has accounted for 68 victims with 20 probables at a loss of only 3 pilots to themselves. Pride of the squadron is 1st Lieut. Kenneth Walsh who downed his 20th victim while escorting Liberators on a raid against Bougainville on August 30th.

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Captain William Craw, with 7 victories and Lieut. Howard J. Finn with 5 are members of the 124th Squadron VMF-112, known as the *Wolf Pack*, has 86 victories against a very light loss. Squadron VMF-213, known as the *Hellhawks*, has 104 victories to their credit and they had a total of only 10 hours time on *Corsairs* prior to going into action. The *Black Sheeps* have 62 victories, the *Swashbucklers* 33, the *8-Balls* 28 and the *Flying Deuces* 22. The *Skull and Crossbones* gang has destroyed 47 planes, 21 barges, 4 cargo ships and 1 tug after only 30 days in action. Major Gregory L. Boyington, of the *Black Sheep*, moved into the company of Joe Foss and Eddie Rickenbacker (Class of '18) when he downed his 26th Jap plane. A former *Flying Tiger*, Boyington got 20 of his victories in a *Corsair*. At this writing Boyington is reported missing while out hunting his 27th, which would have made him America's leading ace of all time. First Lieut. Wilbur J. Thomas, of the *Hellhawks*, got 4 Zeros on June 30th over Rendova, 2 medium bombers on July 15th, 3 Zeros on Sept. 11th over Kahili and 3-1/2 (sharing one with a teammate) on Sept. 23rd over Kahili giving him a total of 16-1/2 in all. The Vought *Corsair* F4U-1 is the standard weapon used on all these missions and few planes have proven themselves so capable in such a short period of time. (See MODEL AIRPLANE NEWS, Nov., 1943 issue.) These reports are all preliminary but serve as a foretaste of the brilliant records which will be achieved in the coming campaigns.

VICTORY

Tojo's Terror

(Continued from page 19)

tries are subjected to such powerful holding corporations.) The aircraft division of Mitsubishi is located in Nagoya and Tokyo and manufactures airplanes for the army and navy, aircraft engines, armaments, instruments and various accessories. Most famed product of the division is the Zero (*Model Airplane News*, January, 1943 issue), with which many Americans are familiar. But no less potent is the OB-01, the latest Navy bomber of the firm.

Basically, it is a conventional twin-engine medium bomber (by our standards) carrying a large load of either bombs or torpedoes and heavy armament. It is a development of the Model OB-97 although considerably larger and heavier. The wing is sharply tapered in both planform and thickness and is swept forward along the trailing edge, the leading edge being almost straight. The fuselage is spacious and oval shape, tapering to a circle at the tail gun implacement. The nose gunner and bombardier are located in the forward portion of the fuselage and the gun is mounted in a transparent cone. It is a 7.7 mm type (somewhat smaller than our .30-caliber Browning but having greater muzzle velocity). The front entrance door is beneath the nose and entrance to all quarters is gained here. The pilot and co-pilot are located side-by-side in the large enclosure and the radio-operator/navigator is located immediately behind them at a table on the starboard side. An upper gun im-

(Turn to page 56)

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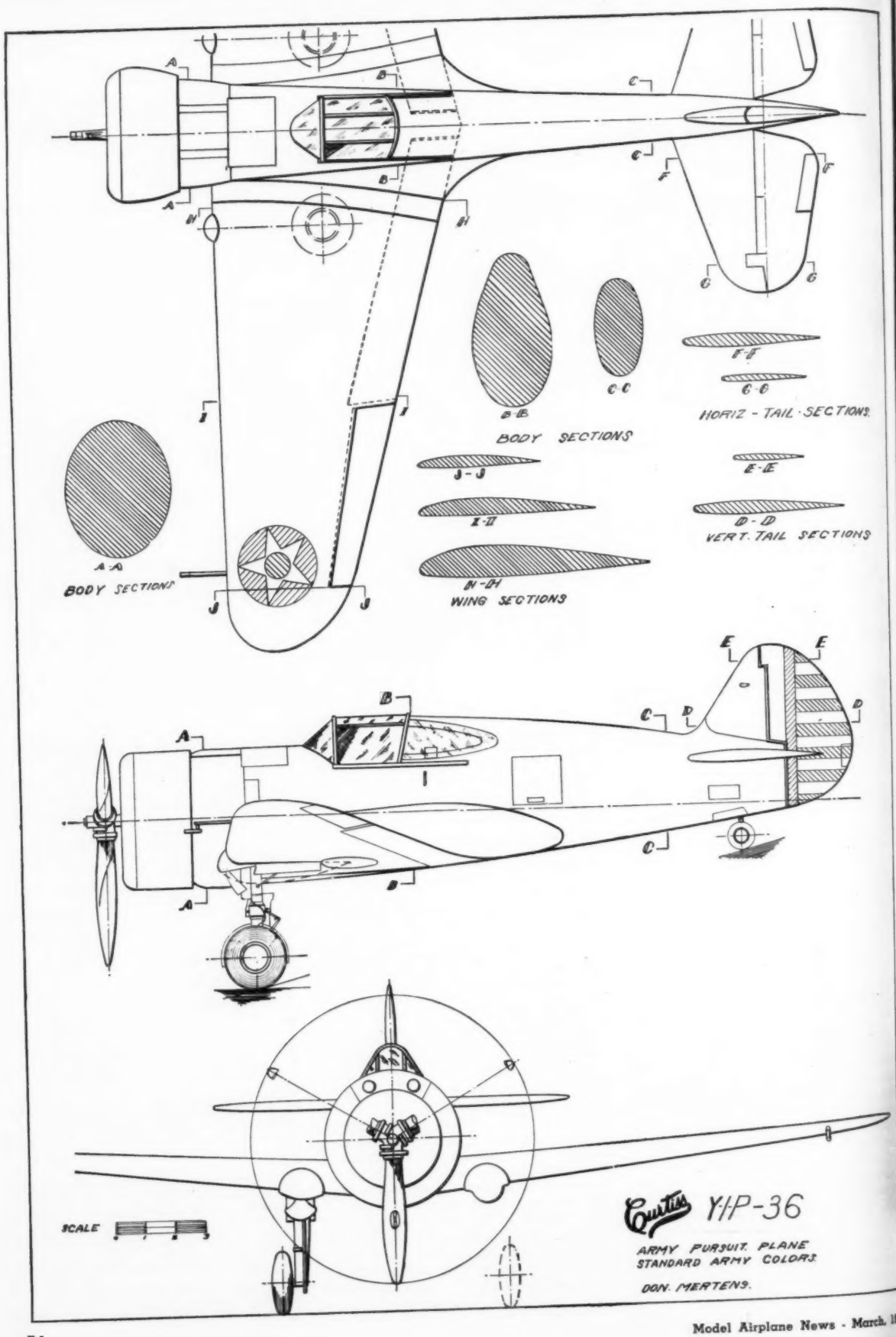
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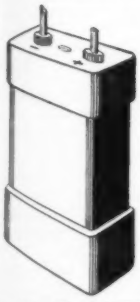

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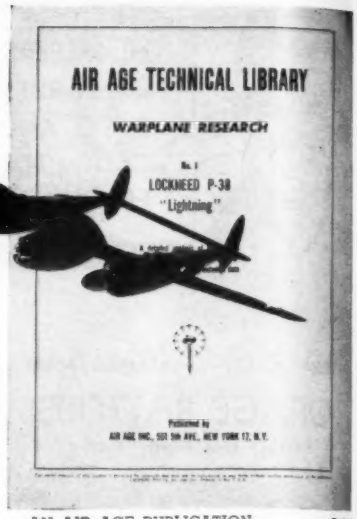

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Tojo's Terror

(Continued from page 53)

placement is located on the top of the ship immediately aft of the cabin. Again, a 7.7 mm weapon is fitted. This blister is remarkably reminiscent of that used on the early Boeing B-17 in which the gun moves fore and aft in elevation and the turret moves laterally in azimuth. The forward portion of the blister is fitted with a hinged section through which the navigator may take sights.

Two blisters are located amidship on either side of the fuselage aft of the bomb bay and operate in much the same manner as the dorsal blister. The tail cone houses a manually operated 7.7 mm machine-gun and Allied examiners have observed the size of this implacement in amazement as only the smallest of the group could squeeze himself in.

This adds up to a total of five machine-guns, all manually operated and all of small caliber. It is interesting to note that no other foreign power has developed a .50-caliber machine-gun, although all use the 15 and 20 mm shell-guns.

The tail surfaces are of the conventional full cantilever type with fabric covered rudder and elevators. Trimming tabs are fitted to all control surfaces, including both ailerons.

The bomb bay is rather small and it is doubtful if its capacity is greater than about 4,000 lb. of bombs. Two 18-in. torpedoes are carried in some versions and have been successfully delivered upon occasions.

The OB-01 is powered by two Mitsubishi *Kinsei* 14-cylinder air-cooled radial engines mounted in nacelles in the leading edges of the centersection. The *Kinsei*, which means "Golden Star" (other Mitsubishi engines are named "Bright Star" and "Holy Star"), has a displacement of 1970 cubic inches putting it in the Wright *Cyclone* and P & W *Twin Wasp* category. It carries a single-speed geared supercharging impeller turning 8.48 times crankshaft speed. The engine is 47.9 inches in diameter and 64.8 inches long. It develops 1,000 hp at 2,500 rpm for takeoff and is rated 990 hp at 2,400 rpm at 9,185 feet. It can produce 1,075 horsepower at 2,500 rpm at 6,560 feet in emergency.

The Mitsubishi OB-01 has a wing span of 80 feet and is 64 feet long. Although no other details are available it would appear that it weighs about 25,000 lb. fully loaded and has a top speed of about 260 miles per hour.

It is designed for carrier operation which seems possible insofar as Japanese carriers have an unrestricted deck space from which bombers of the span of the OB-01 might take off. It was first in action in the early Gilbert Island campaigns and later in the Battle of Midway, the latter certainly suggesting the use of a carrier for its operation.

Various observers report that the Tokyo Engineering division of Mitsubishi is one of the largest and most up-to-date aircraft factories in the entire world and production, according to these sources, is at near capacity. It may be assumed, then, that large numbers of the OB-01 are now in service, although Japan, like Germany, has cut her bomber production by more than 50% in order to concentrate on fighter planes for defensive operations.

Principal difficulty seems to be in securing adequate crews for the operation of this type machine. The OB-01 has a normal crew complement of 8 men and 9 may be carried and many of these machines have been found by Allied soldiers on captured enemy airdromes in such a state as to preclude the possibility of their use in less than 3 or 4 months previous. Thus, it would appear that such "heavy" machines as the OB-01 are being largely neglected in the outer fringe of Japanese-held islands in favour of the Zero and Mitsubishi G-97 two-seat torpedo-plane and dive-bomber.

Workmanship on captured OB-01s has been fairly good, although comparatively light, suggesting low load factors in its design. Extruded sections are small and the skin is not more than .032 to .040 on the fuselage and wing. The propellers are faithful copies of our Hamilton Standard controllable design and represent very good workmanship. The transparent material used in the enclosure is very poor, however, and fogs up quite easily, rendering visibility difficulty. Many were found with these panels knocked out for visibility.

(Turn to page 58)

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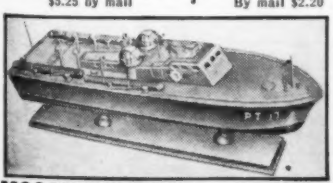

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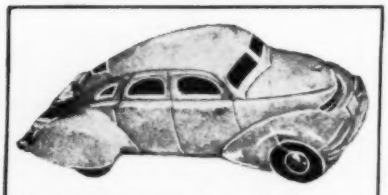

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Although Japanese airplanes, on the whole, are no match for those of American make, it must be borne in mind that a torpedo or a bomb, or a bullet, does just as much damage when it hits, regardless of the airplane delivering it; and in this respect Japanese airplanes are effective . . . though still no match for those of the Allies!

VICTORY

Club News

(Continued from page 20)

They were welcomed by all members present.

For the coming season the club is going to have optional launchings so that the contestant can use a hand launch or off the ground.

The members were notified that the Ladies' Auxiliary was disbanding so they named Ocie Randall to the Editorship of the F.G.M.A. News.

Some discussion about the point system was raised and the contest director was asked to try to evolve some system suitable to all.

Oakland

Miss June Dyer of the East Bay Aeroneers sends us a detailed report of two recent contests held by this group:

"It looked like 'old times' when the East Bay Aeroneers of Oakland held the largest gas model contest of the year. Cars filled with modelers crowded the parking area. Just about every one of the E.B.A., one hundred active members, were there. The day was fine until a strong wind came up, causing a high percentage of crackups, but the boys were out to *fly* and they did!

"The five-minute limit was used, together with a 15 second motor run, as the field is very small.

"There were trophies for each class, special trophies for Atom and Cyke powered ships and one for 'high time' of the day. An 18-inch gold cup was donated by Bud Cope, Gordon Blue and Barney Tesch, E.B.A. members, for the winning ship powered with an engine over .59 disp., for the E.B.A. Club members only, to be put up at every contest. It is permanent to anyone winning it three times in succession. The merchandise prizes were exceptional; every contestant received at least two prizes. The hobby shops of San Francisco and Oakland are backing the model builders by their generous prize donations and are helping to make all contests outstanding.

"The Cyke trophy was won by Russ Watkins, together with four other tro-

phies, his Westerner being given full credit.

"There is no doubt that Don Foote rated high honors of the contest when his Forester '29' powered Westerner hopped off the board to catch one of the few thermals of the day.

"Jack Dyer won the Atom Trophy with his own design Gremlin, and Jack Burke won Class A with a beautiful Micro-powered Challenger, catching one of the other few thermals.

"Bud and Pop Romak had a little tough luck; Pop met up with a few telephone wires that can sure mangle a perfect wing.

"The fellows from nearby clubs turned out in good numbers. Chas. Dorsett of the Frisco Vultures had a fast-climbing Zipper, powered with a Tiger, that made everyone 'stop and look.' There were many good looking jobs on the field; the boys are building with care and can sure fly 'em. Built-in, fool-proof dethermalizers are saving the boys lots of money, motors, and worry.

"Always on the job are the 'untiring timers'; they stick through heat and cold, but never receive any mention, though without them there would be no contest. So to them: Bill Barber, Les Martin, Don Foote, June Dyer, Paul Romak, Russ Watkins and Dick Oldershaw, go a word of appreciation for their constant help. Also thanks to Betty Romak and the ladies who assisted her at the registration desk."

Results (6 highest times in each class):

Class C

Russ Watkins	9:26
George Metteer	6:38
Les Martin	5:56

Class B

Don Foote	9:03
Bill LaFond	6:15
Milton Taylor	5:18

Class A

Jack Burke	4:00
Lerew	2:44
Bud Romak	2:07

"A Hand Launch Glider Contest was held a few weeks later. There was a light drizzle and positively no thermals, but the boys had some fair flights. Jack Dyer won the trophy with a total of 126 seconds for 3 flights. Jack Burke, an expert builder, also got good time. Don Foote was right in line; it was Don's first attempt at gliders. One lady flier, June Dyer, 'also tried,' coming in 19th. Prizes galore for everyone who entered.

"The Aeroneers are grounded at present as there is no field close by for gas flying, but they are keeping club members interested with worthwhile glider contests.

"Thirty to fifty members attend meetings every Monday night at the Y.M.C.A., which proves the boys are sticking together. After meetings Bud Romak, Jack Dyer, and Bud Cope have been giving experimental microfilm exhibitions, creating a new interest.

Results of H.L. Glider Contest:

				Total sec.
Jack Dyer	:54	:36	:36	126
Jack Burke	:36	:30	:25	91
Jack Dyer	:34	:27.5	:26.5	88

"Until further notice there will be no monthly contest of the East Bay Aeroneers. Our field is closed at Pleasant Hills as it has been plowed and planted and we have been warned to 'keep off'."

Bakersfield

The Bakersfield Gas Model Airplane Association notifies us that:

"Our club has done a little reorganizing to the effect that election of officers was held and the following officers were elected: Bill Barnes, president; Vernon Oldershaw, vice-president; and Francis Stewart, secretary-treasurer.

"We are holding a club contest that will be an open affair to see what will turn out. With what we find out at this contest we will lay plans for future contests.

"We would like very much to attend the last contest of the year in Fresno, if you can give us a guarantee there will be no wind. Maybe so, who knows? Yours till later. Signed, Francis Stewart, Secretary."

Ohio

Walter Netts, secretary of the Petrol-Airs Model Club, 1005 Pine Street, Springfield, tells us this club is still flying though lately no contests have been held. The club is putting on a drive for new

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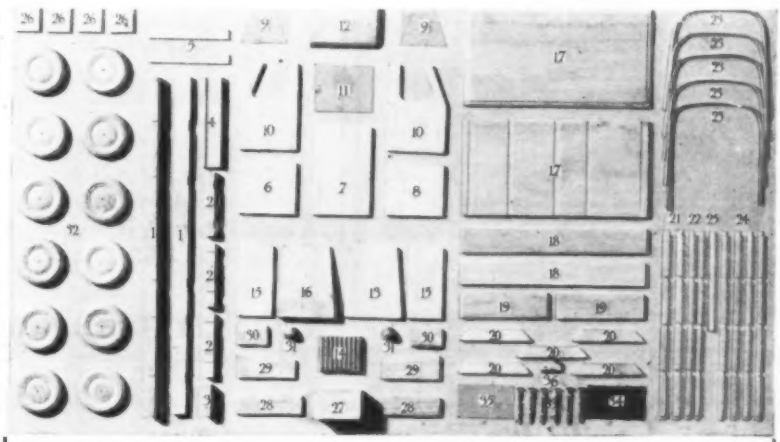

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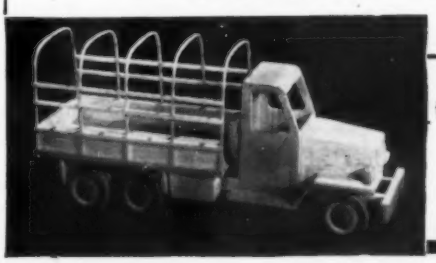

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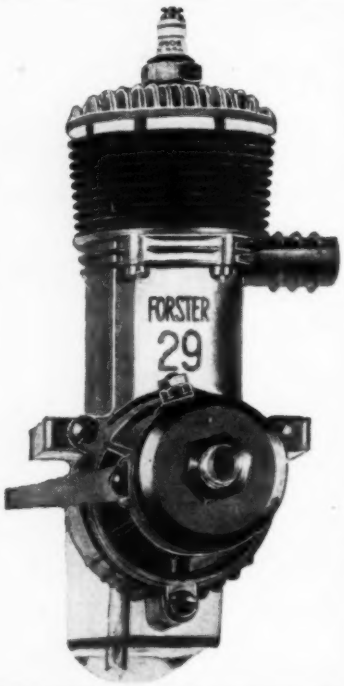

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members. Anyone interested in joining this progressive group should contact Mr. Netts.

New York

The Prop Spinners Club, 87-08 Grand Avenue, Elmhurst, has not allowed anything to interfere with activities. The Prop Spinners have entered many contests—both local and out-of-town—and won at least one event in each.

The club gas contest was recently held after a week's postponement due to bad weather. On the contest day flying conditions were almost perfect. There was practically no wind and it was quite warm. Results were:

Dick Proffit.....2:04.2
Art Horak.....1:56.2
Alan Englehardt.....1:27

There were two thermal flights during the day—Art Horack doing 4 minutes, using a dethermalizer. Bill Fletcher's Dodger was lost again after 9:30 minutes. The Dodger is two years old, and has won a dozen contests since it was first flown. This is the sixth time this model has been lost; this time a stuck dethermalizer caused the trouble.

At the 2nd Annual Long Island Rubber Model Championships, held at Hicksville, the day was windy and cloudy; therefore times weren't very high. Nevertheless, two national records were set under AMA rules.

Bob Smith of 551 Central Avenue, Orange, N.J. (a member of the Linden M.A.C.), flew his Junior Class D Towline model for 5:16.6 minutes.

Richard Knauss of 190-01A Chocheron Avenue, Flushing, N.Y., bettered the previous time by about 5 seconds. He flew his Junior Class D Hand Launch Glider 28.6 seconds. The model was an original design by Frank Koditek, U. S. Navy. Other contest results:

Fuselage Class C & D
Joe Nuszer, New York City.....3:46.0
Bill Grahame, New York City.....3:41.4
Bernard Collins, Providence, R.I....2:52.0

Stick Class C & D
Joe Nuszer, New York City.....2:59.2
Bill Grahame, New York City.....2:54.8
Dr. Leslie Stuart, Providence, R.I...2:22.2

Towline Class C, D & E
Bob Smith, Orange, N.J.....5:16.6
Warren Fletcher, Elmhurst, N.Y....2:20.0
Robert Hatschek, Flushing, N.Y....1:48.2

Hand Launch Glider, Class B
Bernard Collins, Providence, R.I....1:09.0
Bill Grahame, New York City.... :59.0
Dick Proffitt, Jamaica, N.Y..... :51
L.I. Sr. Rubber Model Champion: Joe Nuszer.
L.I. Jr. Champ: Warren Fletcher.

Prizes in all totaled over $100, contributed mainly through the generosity of model companies and magazines.

Despite present conditions, the Prop Spinners Club is going ahead with plans for its 5th Annual Gas Model Contest. Scheduled date is Sunday, June 25, 1944, at the Hicksville Field, N.Y. The meet will be AMA sanctioned. There will be $150 in prizes.

The 3rd Annual Rubber Model Championships will be held at the same field on Sunday, October 1, 1944. It will be AMA sanctioned. Prizes total over $100.

For entry blank and full information contact Mr. R. Horak, 35-30 94 Street, Jackson Heights, N.Y.

Canada

Mr. Charles Fox, president of Windsor Model Aircraft Club, 793 Argyle Road, Walkerville, Ontario, writes:

"During the past few years contests for scale models seem to have been neglected to a great extent, especially in this part of the country. With the lack of rubber, balsa and motors, scale models have become much more important than formerly, since they can be constructed from nearly anything.

For this reason the Windsor Model Aircraft Club, which has been doing its utmost to keep modelling alive in this locality, is sponsoring a contest for non-flying scale models on the second Friday in February, 1944.

"The scale model contest is the major event in an exhibition of models that the club is putting on on the above date. The object is to raise funds for our sixth annual outdoor contest to be held in the summer.

"Rules for the scale model contest are as follows:

"1. Models may be of any plane in use by R.A.F. or R.C.A.F. in present war. (This, of course, includes nearly all American planes.)

"2. There will be two classes of models: solid scale and built-up scale.

"3. Models must be accompanied by a tag bearing the name of plane, name of builder, and scale of the model.

"4. Judges will be three prominent Windsor residents connected with full scale aeronautics. Their decision will be final.

"5. Models will be judged by accuracy to scale, finish and general workmanship.

"6. There is no entry fee. Prizes will be model supplies and other useful merchandise.

"7. American model builders are welcome to enter. Anyone unable to attend may enter models by proxy. Information on this may be obtained by writing to me.

"The remainder of the display is just

to acquaint the general public with model building. A few of the events scheduled are: motor starting contest, indoor endurance, speed, solid scale, built-up scale, flying scale, bomb dropping, slow glider contests, unusual types of flying models (ornithopters, helicopters, etc.).

"American boys are cordially invited to enter and although we can't offer much in the line of prizes in anything but the scale model contest, we will be able to give them a bigger and better gas model contest next summer."

Utah

Mr. Jack Douglas of 125 East 2nd South Street, Salt Lake City, State Contest Director for AMA, feels very strongly on the subject of judging models. Here are the results of thought he has given the subject:

"During the last couple of months model aviation here in Utah and surrounding areas has shown a decided trend toward increased interest in scale model aircraft of all kinds.

"As State Contest Director for the Academy of Model Aeronautics, I have not only noticed this trend, but several sponsors have asked me to help them in scale model events of all kinds and types.

"Scale models have always been a passion with me. I have been building them for nearly twenty years and with that much experience through the years I have developed, after much changing and re-arrangement, a completely balanced set of rules for scale model competition.

"Perhaps the publication of these rules would give other sections a chance to lend their observations.

"We hope this will further interest in model aircraft."

Scale Model Rules For Judging Either Gas or Rubber Powered Models

To eliminate the human element of judging this type of competition as much as possible each separate part of the aircraft is given a certain number of points for certain arrangements. Each separate part is also graded together with all other parts proportionately.

The purpose back of these rules is to encourage the building of all types of models of real aircraft rather than just the simple high wing floater type which has been.

I LANDING GEAR

	Points
1. When non-retractable—just wire shock	0
2. When non-retractable—rubber shock absorbers	5
3. Retractable gear inward—wire shock—not in flight	20
4. Retractable gear inward—wire shock—in flight	35
5. Retractable gear inward—wire shock—will open in flight	75
6. Retractable gear inward—rubber shock—not in flight	25
7. Retractable gear inward—rubber shock—in flight	40
8. Retractable gear inward—rubber shock—will open in flight	80

Note: In cases 5 and 8 these points are in addition to points gained in retracting the gear.

II WING

1. High-wing	0
2. Mid-wing	5
3. Low-wing	35
4. Biplane	30
5. Triplane	55

III MOTOR

1. Single in-line	0

(Turn to next page)

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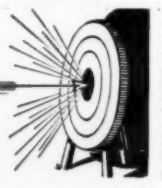

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7. Four motored—either in-line or air-cooled—with either one or four model engines driving.....150

IV WING LOADING
1. Up to 8 oz./sq. ft..... 0
2. Up to 10 oz./sq. ft..... 20
3. Up to 12 oz./sq. ft..... 30
4. For each additional 2 oz. above 12 oz./sq. ft..... 10

V MILITARY AIRCRAFT
Any nation, any type..... 10

VI SPECIAL FITTINGS
Parachutes, smoke, bombs, etc., each 20

VII MOTORS (on gas models only)
1. If scale is open upright..... 0
2. If scale is open inverted..... 5
3. If scale is open on cylinder, closed on case upright..... 15
4. If scale is open on cylinder, closed on case inverted..... 20
5. If scale is open on closed upright 30
6. If scale is inverted..... 40

VIII POWER LOADING
1. 80 oz./cubic inch displacement.. 0
2. For each additional 50 oz. loading 10

IX AMPHIBIANS
With wheels built in open position (if retractable see above)..... 25

X COVERING
1. Tissue or Silkspan—no colored dope 0
2. Tissue or Silkspan—with colored dope 15

Special Points For Flight

I TAKEOFF (from the ground unassisted)
1. Nose over or ground loop..... 0
2. Long run (over 30 feet)..... 5
3. Too short run (less than five feet) 10
4. Between 5 and 30 feet run..... 20

II DIRECTION OF FLIGHT
1. Violent spirals—stalls..... 0
2. Smooth curve..... 5
3. Approximately straight flight.... 15

III ALTITUDE
1. Climb is vertical—stalls..... 0
2. Climb less than 10 ft. during flight (estimate)..... 5
3. Climb more than 10 ft. but not at steeper angle than 45 degrees... 15

IV APPROACH
1. Glide settling at steeper than 45 degrees 0
2. Glide settling at less than 45 degrees curve..... 5
3. Glide settling at less than 45 degrees straight..... 15

V LANDINGS
1. With power stops on contact.... 0
2. With power bounces or noses over 5
3. With power 2 pts. rolls to stop.. 20
4. With power 3 pts. rolls to stop.. 30
5. Without power stops on contact 0
6. Without power bounces or rolls over 5

WHAT DO YOU LIKE BEST IN THIS ISSUE?

We are anxious to publish the features *you* want to read. Drop the Editor a line.

7. Without power 2 pts. rolls to stop 25
8. Without power 3 pts. rolls to stop 40

VI MANEUVERS (Must be described before trial is made)

1. After takeoff one 360 degree circle and land upright..... 50
2. After takeoff two 360 degree circle and land upright..... 75
3. After takeoff one loop and land upright 125
4. After takeoff two loops and land upright 175
5. After takeoff roll.....100

Do you agree with Mr. Douglas? We invite your comments.

New Jersey

Mr. Edward P. Schlosser, 178 Main Street, Ridgefield Park, tells us:

"The American Society of Model Aero Engineers, with headquarters at 178 Main Street, Ridgefield Park, announce an "open house policy". All those interested in rubber powered, towline and hand-launched glider contests, and group building sessions, should contact Mr. Schlosser at the above address on Friday evenings at 7:30 p.m. We have been holding contests every flyable Sunday for the past several years on a giant field not far from the headquarters. Although we have many builders in the armed forces we still carry on with fifty active ones. Sorry, no gas model activities for the duration."

VICTORY

Cleaning Stubborn Spark Plugs

(Continued from page 17)

the bottom wall of the cleaner.

Leave the tire valve in the air nozzle to prevent sand from being drawn into the air pump attached to the air nozzle during the pump suction stroke. Cut away about 1/3 the valve spring, however, so that it takes but little pressure (about 3 or 4 lbs.) from the pump to open it. For supplying compressed air, an ordinary bicycle tire pump is satisfactory. The hose supplied with it is used for connecting the pump to the air nozzle while the cleaner box is held rigidly in a vise, the jaws contracting the ends of the box (not the front and back, or the glass might be broken).

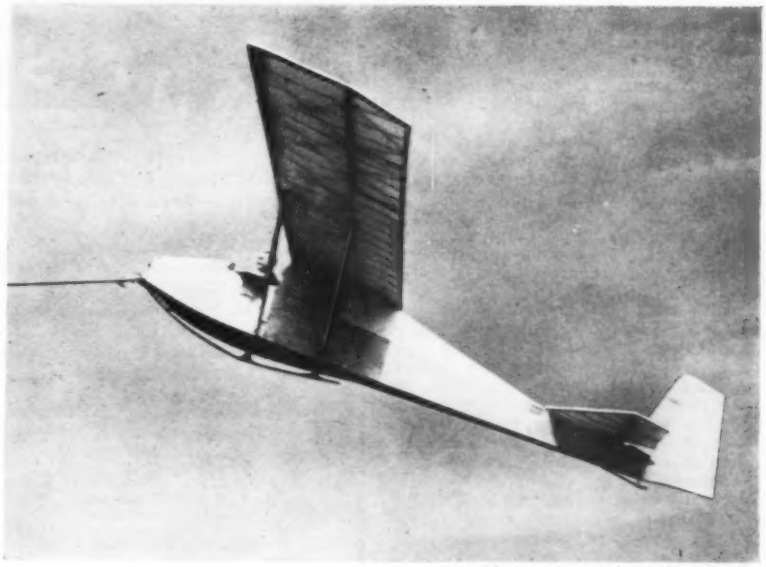
In the upper end of the valve stem, a piece of copper tubing is soldered to serve as an air discharge nozzle. The hole in it is not greater than 1/16" in diameter when a bicycle pump is used as a source of compressed air. It can be larger if you use an automobile tire pump or an air line from an air compressor.

The sand nozzle, made of 15/32" square wood, is glued in the position shown. It has a vertical bore 3/16" in diameter (for an air discharge nozzle of 1/8" outside diameter) through which sand is blown by venturi action against the spark plug. The air then travels between the baffle walls as shown by arrows in Fig. 4 and discharges through fabric-covered air discharge openings. Fabric is some loose mesh material such as worn but sound muslin glued to one of the end walls. Openings are formed by drilling (see dotted lines in Fig. 5) and cutting.

To assemble the cleaner: air nozzle is screwed tightly into position, walls are glued together and sand nozzle is glued in position. After glue is set sand the front till perfectly level. To do this, lay fine sandpaper on a true flat surface and move the cleaner over it. The direction of movement should be parallel to the vertical walls.

The front is then covered with a piece

CADET *Presents a New Training Aid for* Glider Courses in Industrial Arts . . .



Photos: International News Service

Because air-conscious young America is turning to gliders with increasing interest, the advent of the Cadet UT-1 Glider is very timely. This utility single-place trainer is practically spinless and of extraordinarily safe characteristics. . . . The kit for assembling the Cadet UT-1 Glider is recommended for supervised clubs as well as for industrial arts courses. Produced by foremost aeronautic engineers, this is but one of many New Cadet Training Aids which are assuming an important role in the teaching of flying fundamentals.

Photos above and at left: Utility glider, identical with the CADET UT-1, now being used in England by Air Training Corps members.

SPECIFICATIONS of CADET UT-1 GLIDER

- SPAN—38 ft. 4¾ in.
- LENGTH—20 ft. 10¾ in.
- WEIGHT (empty)—276 lbs.
- GROSS WEIGHT—450 lbs.
- GLIDING ANGLE—14:1
- SINKING SPEED—4 ft./sec.
- STALLING SPEED—25 mph.

Inquiries are invited from Schools and Clubs for data on this and other Cadet Training Aids.

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of window glass cut to proper size and held in position with two strips of picture binding or scotch tape. Proper sanding results in a satisfactory air-tight joint between the box and glass. Glass is used as a front wall so that operation of the cleaner and condition of the spark plug during such operation can at all times be observed.

After the cleaner is charged with sand it is ready for use. Ordinary sand of the proper size can be used but Carborundum grit does a better and faster job. Fill the cleaner through the spark plug hole to about the extent illustrated in Fig. 4. The spark plug is then inserted and the pump operated for blasting the plug clean.

Before inserting the spark plug in the cleaner, wash it twice with gasoline, burning it out each time by touching a lighted match to it. This vaporizes any oil and dries the plug so the sand does its work without sticking between the shell and insulator, as will happen if they are gummed with fuel and oil. The carbon deposit on a plug may be softened somewhat by soaking it about a half hour in a bottle of carbon tetrachloride. Don't shake the bottle, however, as that is almost certain to bend the shell electrode and either reduce or close the spark gap. After sand blasting a spark plug, be sure to carefully clean out any remaining sand or air blast to prevent it from getting into your engine and scoring the piston or cylinder. Incidentally, carbon tetrachloride tends to rust steel and rust getting into an engine does it no good. A rusted plug should be cleaned with a suede shoe brush, having soft brass bristles, and the threads oiled. The hexagon body of the plug can be enameled with stove enamel.

Many spark plugs that seem hopelessly fouled can be actually retrieved for many more hours of service by the use of a sand blast cleaner of the kind described, and you will find it well worth the hour or so it takes to make it.

VICTORY

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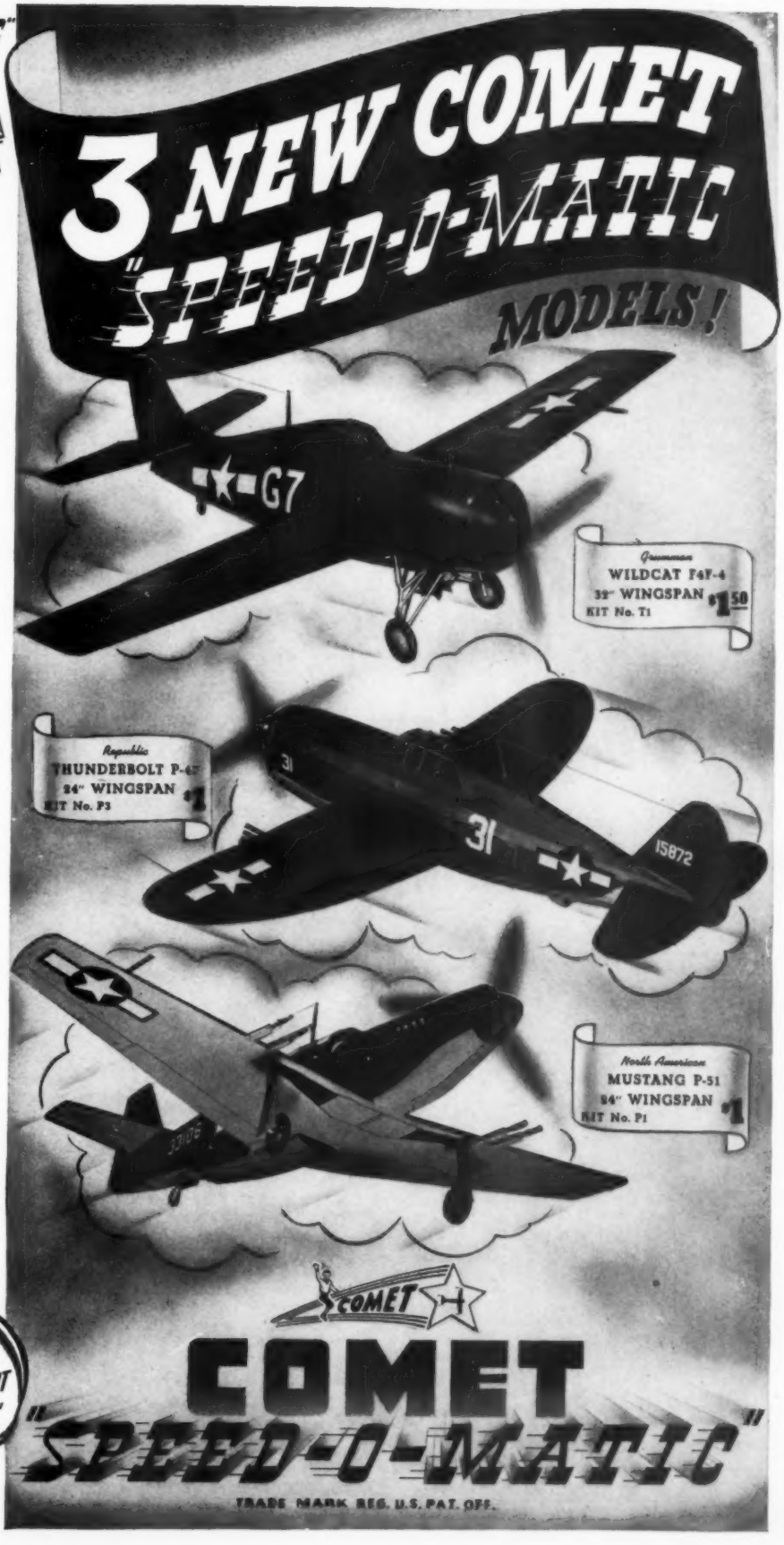

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